

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXIV. No. 625

JUNE 20, 1931

Prepaid Annual Subscription:
United Kingdom, £1.1.0; Abroad, £1.5.0

Contents

	PAGE
EDITORIAL: A Jubilee Chemical History; German Chemical Research; The Urge to Consume; "The Chemical Club"; Overseas Chemical Trade	547
British Chemical Industry of To-day	549
Spectrographic Assay of Metals and Alloys	549
Annual Report on British Alkali Works (II)	550
British Overseas Chemical Trade in May	552
Chemical Production in Canada	553
Chemical Import Trade of India	553
By-Products from Bituminous Coal	554
Magnesium Compounds in the United States	555
Preparation of Synthetic Resins from Alkali Lignins	557
A Bookman's Column	559
From Week to Week	561
Patent Literature	562
Weekly Prices and Market Reports	565
Company News	570
Commercial Intelligence	572

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to THE CHEMICAL AGE is 21s. per annum for the United Kingdom, and 26s. abroad. Cheques, Money Orders, and Postal Orders should be made payable to Benn Brothers, Ltd.

Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, have for some years past adopted the five-day week, and the editorial and general offices (Bouverie House, 154, Fleet Street, London E.C.4), are closed on Saturdays.

Telegrams: "Allangas, Fleet, London."

Telephone: City 0244

A Jubilee Chemical History

DR. STEPHEN MIALl undertook a difficult task when he consented, for the jubilee of the Society of Chemical Industry, to write the *History of the British Chemical Industry* just published by Ernest Benn, Ltd. (pp. 273, 10s. 6d.) He has done it as well as anyone could hope to do within the limits of a single volume of companionable size. He has obviously had to choose between the only two possible methods of approach. One was to produce a broad landscape or generalisation which the reader could understand at a glance without being concerned in its detail—a view of the wood without the trees. But that would not have been a history. A history, to justify its name, must have its anatomical structure, and once the historian of so vast and complex a field as industrial chemistry condescends to touch facts he is sucked into a current of dates, places, personalities, processes, and products from which there is no escape. So Dr. Miall, though few command a more picturesque touch, has disciplined himself to tell in detail a sober story of the British chemical industry, from its rather casual beginnings about the close of the eighteenth century through all

its wonderful developments up to the present time. Even so, he has produced a book of great interest, which is a vast storehouse of orderly information, the first of its kind to be attempted in this country, and one that the reader will often reopen to refresh his memory or verify a reference.

The vast field, to which it is difficult to fix any boundary, has had, of course, to be treated in sections. The first to be dealt with is naturally the heavy chemical branch, for that is the basis of British chemical industry and is still its strength. The dyestuffs industry follows as our most remarkable post-war achievement. Then come chapters on the fascinating fermentation industries, with their very old and very new processes, on drugs and fine chemicals, with foundations going far back and many notable recent advances, and on the cellulose industry, with its immense modern organisations. Metallurgy, so closely related to industrial chemistry, gas, coke, and tar, one of the greatest branches of the industry, paint and varnish, and soap, all come in succession into the story, which is finally rounded off with notes on miscellaneous developments.

No specific account of war and post-war work has been attempted, but much about this is woven into the general narrative, with passages here and there, like those quoted from Mr. William McNab on chemical war production and from Colonel Pollitt on the synthetic nitrogen works at Billingham, that vividly recall these wonders. Nor is there any separate chapter on chemical engineering, though here, again, its importance is everywhere implied in the record of the new processes introduced in recent years. In this way, smoothly and in ordered sequence, the reader is taken on a round tour of British chemical industry, at the end of which he will have seen nearly all that is really material. It is a piece of good and patient work of permanent value. The book is illustrated by many portraits and some good charts. Sir Harry McGowan, this year's president of the Society, contributes a model foreword.

German Chemical Research

WHATEVER may be Germany's political and financial condition, the importance of research, especially in the chemical industry, is as fully recognised as ever. Statistics compiled by the Reichstag Committee on Industry, etc., show that of the total number of employees in German chemical industry, 4 per cent. are engineers, chemists, and members of professions. This is a higher percentage than in any other German industry. Of the directions in which German chemical research is working, some notes by the American Consul General at Frankfort-on-Main give some indication. Among the practical problems now being investigated

are the production of sulphuric acid from gypsum; a bleaching preparation that will not injure textiles; and several important pharmaceutical products, especially those to combat tuberculosis and cancer. The development of new metal alloys of great hardness, resistance to corrosion, or possessing very active catalytic properties, is sought by the metallurgical chemistry branch. The protection of metal surfaces by paints and plating is a subject offering many opportunities for important improvements. The chemistry of fuels and hydrocarbons is still confronted by a multitude of unfinished tasks. The hydrogenation of coal remains to be solved, and the new method of catalysis under high temperature and pressure is looked forward to as a means of opening a world of unknown reactions, including synthesis of many acids, solvents, intermediate products for dyes, pharmaceuticals, scents, and synthetic resins. An endless series of experiments with coals, oils, and natural gases is being carried on by this method, each under a different pressure or temperature, or with different catalysts. The biochemistry branch is studying the chemical processes in the living cell. Certain bacteria producing fermentation are made to work for the chemical manufacturer, yielding lactic acid, citric acid, alcohols, acetic acid, glycerol, etc. Another important field of biochemical research is the soil whose bacterial life is full of unsolved problems of great importance to scientific fertilising and perhaps also to the chemistry of fermentation.

The Urge to Consume

THE world, particularly the United States, is producing or manufacturing to-day too much of everything. Heroic measures have been adopted to find outlets for the products of the mines and the factories. We are urged to travel more, eat more, smoke more, wear more, and the great system of buying by instalments has been thrust upon us. Wages and the standard of living have had to go up so as to increase consumption. What has been the result? Are we not enslaved to keep in motion as much and as many as possible of the material goods instead of enjoying the freedom which an intelligent and temperate use of them might give us? At all events the machine has broken down; for one reason or another the people are not able to go on consuming at the same rate as commodities are produced and something must be done without delay to formulate a workable plan of stabilising production.

In the old days, when we, so to speak, lived in separate parishes with but little inter-communication, the economic laws soon had their effect. When a loss was imminent, the factory or mine was closed. To-day all the resources of chemistry and engineering are brought in to reduce still further the cost of production—more men are replaced by machines, rationalisation proceeds apace. The very cure augments the evil. We have reached the doctrine of "Science in industry," but, like the rain in an English summer, there appears to be a little too much of it. Yet no one can halt progress and the chemist will go on inventing new and better processes and cheapening old ones. What is the cure? Politicians seem unable to find one; indeed, their puny efforts only add to the difficulties. We have heard a return to craftsmanship advocated, when men,

as in days now past, will take an honest pride in their work, and we shall be glad to pay a small premium over machine-made goods to beautify our homes, our towns, our countryside.

Overseas Chemical Trade

FOR the *third* time since February of this year, the Board of Trade returns for British overseas trade show a decided improvement in respect of chemical exports. During May these were only 15.4 per cent. below the figures for May, 1930, whereas in February they were 40.4 per cent. below the figures for February, 1930. The steady improvement traced through March (when the percentage fall was only 30.5 per cent.), and April (when it was 19.4 per cent.) now reaching the figure of only 15.4 per cent. for the month of May, is a welcome sign that the tide is beginning to turn. This is more or less confirmed by the fact that imports have reached an approximate level in comparison with exports, being now only 16.4 per cent. below the corresponding month of 1930. This figure of 16.4 per cent. for imports during May is certainly higher than the percentage fall calculated for February (11.3 per cent.), but it should not be overlooked that exports during April were actually 4.8 per cent. higher than those during April, 1930. This greater decline during May is therefore merely the result of the tendency to lay in extra stocks of material during April in anticipation of trade revival. Percentage figures always portray the position much more faithfully than do the bare totals of statistics presented in official returns.

"The Chemical Club"

THAT most comfortable institution, hitherto known as The Chemical Industry Club, is for the future to be known as "The Chemical Club." That is to say, a general meeting of members has decided to make the change by 33 votes to four, and unless substantial disapproval is indicated by the whole body of members, the change will take effect on June 27. Whether much depends on such a change of name is a matter to be determined by experience, but it appears to be thought that the new title may make a wider appeal than the old one, which was associated with "chemical industry." It was our belief that anything chemical, by whatever name it was called, would smell equally sweet, and we cannot hope for a much better managed institution than the present under any title. Membership, however, is an important point, and if the new title attracts a few more to the support of a club that thoroughly deserves support, everyone will cheerfully accept the change.

The Calendar

June 23	National Physical Laboratory: Visit of Inspection. 3-6 p.m.	Teddington.
July 13	Chemical Plant and Research Instruments Exhibition: Opening 11.30 a.m.	Central Hall, Westminster, London.
July 13-19	SOCIETY OF CHEMICAL INDUSTRY JUBILEE CELEBRATIONS: Annual General Meeting. Presidential Address by Sir Harry McGowan. 10.30 a.m.	
14		Royal Academy of Music, Marylebone, London.

British Chemical Industry of To-day

BY SIR HARRY MCGOWAN

WE reproduce below the "foreword" that Sir Harry McGowan, chairman of Imperial Chemical Industries, contributes to *A History of the British Chemical Industry*, by Dr. Stephen Miall (Ernest Benn, Ltd., pp. 273, 10s. 6d.).

The story of the chemical industry in Great Britain is one of enterprise, technical progress, and achievement. Many names famous in the industrial tradition of this country are found in this book. Many of these names are kept alive for us to-day and honoured by us in the persons of their descendants, who are still active and in many cases notable personalities in the industry. Indeed, it is some justification for the reputed fascination of the industry that so many of these historic names are still to be found connected with it. But there is a stronger justification for that absorbing and, I think, irresistible fascination, and that is the width of interest of the chemical industry. The vast field covered by the chemical industry to-day is largely the result of co-operation which is taking place between the chemist and biologist, the chemist and physicist, the chemist and the engineer, the chemist and the electrical engineer—the marriages of chemistry and almost every other science. The chemical industry is the most poly-gamous of all industries.

No one can read of the early days of chemical manufacture without being struck by the extravagance and wastefulness of its methods. It is difficult to visualise to-day the possibility of great tracks of lovely country being laid waste by fumes. These same fumes have now been caught and snared to become valuable money-making products. It was possible in the old days to have wasteful processes and still make profits. The chemical industry would not have been developed if it had not made profits. Then, as to-day, the ultimate success of an industry depended on its profit-making capacity.

A Period of Intense Competition

The British chemical industry to-day faces a period of intense competition. Half a century ago, Great Britain was still, to a large extent, "the workshop of the world," and her prosperity was still largely dependent on the success of her heavy industries—a success due, in no small measure, to the fact that she was laying the foundations of economic development overseas. The capital she invested abroad, the producers' goods she exported, and the trade on which she prospered have, in themselves, produced competition from nations who have followed her example. The effect of this competition on the heavy industries may, to a certain extent, be permanent. During the same period the world has grown very much richer, with the result that a small proportion of income is spent on necessities, and a greater proportion on luxuries. This increase in the standard of living has had a profound effect on industry, which has had to adapt itself to meet the demands of a much more fickle market. As competition has grown, and as new industries had to be created to meet the demands of a higher standard of living, industry in general has become more and more dependent on the chemist and engineer, until the chemical industry has become the very foundation on which not only British industry, but modern world industry, is erected. To the chemical industry, above all others, flexibility is vital.

In recent years there has been an intensification of another form of competition, viz., that between processes and that between products. The ingenuity of engineer and chemist is producing a galaxy of synthetic products which are coming on the market in competition with similar products of natural and less recent origin; new processes for manufacturing products already on the market are being evolved daily. Examples of this co-called "inter-commodity" competition and "inter-process" competition are so familiar in the chemical industry that it is unnecessary to stress the point beyond emphasising the importance of it as one of the justifications for rationalisation in the broadest sense.

We must not rely on tradition; we must learn to distinguish its lessons of real value. We must not depend on political action. Enlightened sympathy and well directed assistance would help. But ultimately the industry itself is responsible for its future. Though conditions in 1931 are different from those of, say, 1881, although at the moment our difficulties seem greater, there is no comparison in order of magnitude or

range of interest. We have a greater force of skilled technicians and enhanced power of research and infinitely greater resources of capital. These functions cannot be isolated. They must be merged and moulded to one end to maintain and improve the supremacy of British industry. Economic and commercial research must take its place side by side with technological research. Planning and forecasting must be the order of the day.

To be worthy of our fathers is to surpass them.

Spectrographic Assay of Metals and Alloys

Progress of Recent Researches

INVESTIGATIONS on the possibility of utilising the spectroscope for the quantitative assay of impurities in metals, and of alloys, and to standardise reliable methods for carrying out this work, are in progress at the central laboratory of the British Non-Ferrous Metals Research Association. This research is an extension to other metals of work which has already been carried out to explore the scope of modern spectroscopic methods in the detection and estimation of small amounts of impurities in zinc. The latter very successfully demonstrated the applicability of spectrographic methods for the determination of cadmium, iron, lead and other metals in commercial zinc, the accuracy and rapidity of these methods when used for the determination of cadmium in zinc being a result of striking value.

In the present research, which is in the hands of Mr. D. M. Smith, the determination of impurities in copper formed the first practical objective, but this is now being followed by a study of the spectroscopic assay of other metals and alloys, chiefly the analysis of lead alloys and the determination of impurities in aluminium alloys, lead and tin alloys, and in brass and bronze. Simultaneously, some useful research is being carried out which should be of general application in spectrographic technique, such as the study of limits of accuracy and the possibility of increasing the accuracy.

Standard Spectra

Methods used for the measurement of intensities of spectral lines have been carefully reviewed, and a large number of standard spectra have been photographed. Up to the present moment five reports, including one on the spectrographic assay of copper and a later one on the spectrographic assay of ternary alloys of lead, covering the work already completed, have been prepared and are available, together with an atlas of standard spectra, for the use of members of the Association. It is hoped that the development of these quantitative spectrographic methods will ultimately provide the metallurgical chemist with a very useful laboratory instrument to supplement or completely replace tedious chemical methods of analysis, in addition to providing means for rapid and reliable tests on material passing through the works. That this is possible has already been demonstrated in the previous research on zinc, to which reference has been made, for it is well known that the accurate determination of impurities in zinc by chemical methods requires exceptional skill and experience.

Chromium Plating Regulations

REGULATIONS relating to factories and workshops used for carrying on chromium plating operations have been issued under Section 79 of the Factory and Workshop Act 1901, as Statutory Rules and Orders, 1931, No. 455. One of the regulations given is to the effect that the occupier shall see that the official cautionary placard as to the effects of chrome on the skin is affixed in the works in such a position as to be easily read by the persons employed, and shall arrange for inspection of the hands and forearms of all persons employed to be made twice a week by a responsible person, and for a record of such inspections to be kept in the health register. It is also laid down that it is the duty of employers to provide an efficient exhaust draught to prevent vapour or spray entering workrooms. Employees must be provided with aprons and bibs of rubber, leather or some other impermeable material, rubber gloves, rubber boots or other waterproof footwear; suitable washing and clothes storage accommodation must be provided; and an adequate supply of wholesome drinking water must be available. It is also stipulated that all employees must be examined by a surgeon once in every fourteen days. These regulations come into force on August 1.

Annual Report on British Alkali Works.—(II)

Production of Sulphuric Acid, Ammonia and Tar

This is the concluding instalment of our extracts taken from the 67th Annual Report on Alkali, etc., Works (H.M. Stationery Office, pp. 41, price 9d.) This report, so far as it concerns England and Wales, is by Mr. W. A. Damon; the section relating to Scotland is by Mr. J. W. Young.

Alkali and Copper (Wet Process) Works

THE tonnage of salt decomposed was less than in 1929. The quantities were as follows:—

Alkali—	Tons.
Leblanc process	65,347
Cylinder process	8
Wet copper process	10,151

The demand for hydrochloric acid was fairly steady in the earlier part of the year, but a marked reduction took place towards the end. Works have been maintained generally in good order, and only in one instance had serious exception to be taken to the condition of the plant. As a consequence, there was considerable low level escape. The necessary repairs were quickly carried out, but it is well to emphasise once more that a low level escape is much more likely to cause annoyance and to give rise to complaint than that from the chimney top. It is essential that brickwork and pipelines should receive regular attention and, where possible, a suitable fan should be installed to create a positive draught.

At the wet copper works which was adversely criticised in the last Report, a supplementary condenser with fan draught has been erected for dealing with the gases from the topmost bed of the calciner. Conditions are now quite satisfactory, and an additional quantity of useful acid is recovered in the condenser.

Until the last few months cement manufacture has proceeded at a rate comparable with that of the preceding year. Lately, however, there has been a definite lull, and many of the large works are now operating on reduced output in the face of adverse trade conditions. Some, indeed, are closed down temporarily in order to reduce stocks.

Sulphuric Acid Works

It is estimated that production during 1930 fell below that of the previous year by at least 100,000 tons, and this in spite of its increased use for the purpose of "pickling." The decrease must, in large measure, be attributed to the fall in production of artificial silk and of by-product sulphate of ammonia.

Plant for the oxidation of ammonia to oxides of nitrogen has been installed at several works this year. It is estimated that about half of the chamber sets in England and Wales are now so equipped. A matter which has received attention this year concerns the presence of pyridine in the ammonia liquor used in the process. It is stated that a concentration even as high as 2 per cent. is not prohibitive, but that the life of the catalyst is thereby shortened. The presence of more than traces of pyridine is thus an inconvenience, which should be avoided if possible. The use of a platinum catalyst containing 10 per cent. of rhodium is said to possess advantages for consistent high temperature working, but for chamber plant, where it is necessary to vary the output, it is open to doubt whether such an alloy is superior to pure platinum. The use of pyrites in place of brimstone continues to gain ground. In South Wales, it is anticipated that many of the chamber plants will cease to operate, as a result of the large output of acid made from zinc blende by the National Smelting Co.

A new plant, consisting of four Gaillard-Parrish chambers, and designed for liquid phase conditions, has been erected in the London area. This replaces a rectangular chamber set. Although it has not yet worked at full capacity, it has already been found necessary to supplement the existing spent oxide burners by a mechanically operated sulphur kiln. A number of new Mills-Packard chambers have also been erected. At a works in which a Wedge burner is in use, much trouble has been caused by leakages from the water-cooled arms. The arms have now been replaced by others made of a chrome steel; water-cooling being dispensed with. These arms have been in use for a considerable time, proving quite reliable and showing no signs of heat stress. The efficiency of the plant is largely increased, owing to the absence of stoppages for the

replacement of faulty arms, and the avoidance of excessive moisture in the furnace. The management consider that the cost of the arms will soon be repaid by the reduction in nitre consumption alone.

Gas Liquor, Sulphate and Muriate of Ammonia Works

The difficulties with regard to the working up of crude liquor, with which the smaller gasworks especially are faced, do not decrease. The cost of manufacture may allow of no profit being made; indeed, a loss may result. It is frequently not possible to dispose of the liquor to large undertakings unless it be in a concentrated form. There are cases where the liquor is allowed to run to waste, and there are cases where less efficient scrubbing is deliberately practised in order to reduce the make of sulphate because it is supposed, erroneously of course, that reduction of make means reduction of loss. It would be better reasoning and more conducive to efficiency if managers of such works would realise that liquor production is an indispensable part of gas manufacture, and, considering sulphate manufacture as a means of liquor disposal, would concentrate on the reduction of steam and labour costs. It is unfortunate that a great number of plants have a maximum output of 15 cwt. per day, and are extravagant in labour. Replacement, when existing plant is worn out, by larger units would lead to more intensive working for shorter periods and to a reduction in labour costs.

Production of dry neutral sulphate could be extended with advantage. Many works are still making acid salt, which is less valuable and which is becoming more difficult to sell. In many cases, the plant required could be added at small cost, and would not require extra labour for its operation. In fact, some saving would result, for bagging of the salt could be done by the normal staff of the salt house as it is produced.

Messrs. Hollings and Smith, in a recent review of the state of the by-product ammonia industry, have urged that consideration should be given to the organisation of district co-operative schemes, whereby the liquor would be concentrated locally and conveyed to a centre for further working up. Such a plan seems to hold out good promise of more efficient and less costly production.

Considering the lack of profits, plant maintenance has been good, but there is a general reluctance to spend capital on improvements. In a few cases, stills and saturators are being allowed to fall into a lamentably ruinous state through disuse and neglect. This is poor economy, for they will be the more expensive to recondition if and when they are required again. If a plant is worth keeping at all, it should be maintained in order; if not, it should be dismantled.

Purifiers for foul gas have generally been operated in a satisfactory manner, although it has sometimes been necessary to call for more frequent breaking down and revivification of the oxide. The use of longitudinal oxide heaps, where the foul gas is distributed through a perforated pipe, has been greatly approved by the management whenever it has been adopted. The opening of such heaps has invariably shown a very even distribution of the fouled oxide. Satisfactory absorption of acid gases has been effected at all works using the combustion-neutralisation method.

Chlorine Works

New plants at Staveley and Billingham, for the production of caustic soda and chlorine by the electrolysis of brine, have been in operation, and have worked excellently. In May, an accident, which might have had more serious consequences, occurred in Liverpool. It was due to leakage of gas from some old cylinders—probably war relics—which had been stored in a stable. It was necessary to remove the cylinders and to drop them out at sea. Although this accident had no connection with registered operations, it is mentioned because it is felt that similar cylinders, stored elsewhere, may become a potential danger. The possessors of any such are urged to take steps to have them destroyed or emptied. This

should be done under the direction of a competent and experienced person, and precautions must be taken to prevent the escape of any gas into the atmosphere during the operation. The use of 17 cwt. drum containers for liquid chlorine is increasing. There is a considerable saving in carriage over the 70 lb. cylinders, and their use also tends to simplify arrangements of plant.

Venetian Red Works

A new patented process for the production of rouge has been in operation at a Lancashire glass works. In this process, as originally designed, scrap iron is dissolved in weak sulphuric acid to the point of neutrality and the solution delivered to a Kestner evaporator, where it is atomised and dehydrated to ferrous sulphate mono-hydrate. This is then elevated to a storage bin from which it is fed to two gas-fired revolving furnaces, placed in series, and constructed of acid-proof material. From these it emerges as rouge. The presence of ferric oxide aids, catalytically, the conversion of sulphur dioxide to trioxide and the latter is passed into towers, where it is absorbed in acid of a suitable strength. The absorption system has not yet been worked with complete success, and, consequently, in order to avoid unduly high escapes, it has been necessary to insert two limestone towers after the recovery system. These, it is understood, will be retained permanently as a precautionary measure.

Tar Works

Centralising of tar distilling activities continues, owing to difficulties experienced by small works in marketing their products. Corrosion of tar stills occurs at an alarming rate at some works, and is more marked whenever it has been necessary to employ higher temperatures for the production of more viscid tars. A great many experiments have been carried out in this laboratory in an endeavour to throw some light on the subject, from which it has been concluded that ammonium salts are the active corroding agents.

The fitting of 18 in. pitch outlet manholes to pot stills is becoming general and is noted with approbation. Pot stills continue to hold their own in spite of the many types of excellent continuous plant that are available. In large works they are probably as cheap to operate as a continuous plant, and, for products of varying specification, they are certainly more adaptable.

Complaints have frequently been made of annoyance caused by odours from tar works. It is often difficult to trace the exact source; it is thought, however, that in most cases it is caused by running off pitch at too high a temperature. Conditions have been greatly improved at one work since an instrument for the continuous recording of the temperature in the pitch cooler has been installed. The provision of the recorder was not an expensive matter and it has received the unqualified approval of the management, who feel that, by its use, not only have they evidence of the temperature at which any particular batch of pitch was run off, but also that more efficient and more scientific working of the cooler is secured.

With regard to the escape of incondensable gases during the distillation of tar, it has been noticed, on several occasions, that ejectors are not turned on until the tar has "sweated" or that they are turned off before the completion of the distillation. Those responsible have maintained, in such cases, that there is evolution of sulphuretted hydrogen only during a certain stage of the distillation. This is an erroneous supposition; sulphuretted hydrogen is evolved continuously from beginning to end of the operation and must, therefore, also be removed continuously. During the current year it is hoped to demonstrate this point by making quantitative estimations during the working up of different tars and tar oils.

Electrical precipitation methods for the removal of tar from coke oven gas are now commonly employed. A careful study of their application for ordinary town gas purification has been made at Hinckley gasworks, under the direction of the Institution of Gas Engineers.

Benzene, Pyridine and Hydrofluoric Acid

The means adopted to prevent the escape of noxious gases at benzene works have been satisfactorily carried out at all works, and no difficulties have been experienced.

Trade in pyridine has been very poor and but few plants have been in operation. Acid catches should be provided to avoid loss of pyridine and consequent complaint, for it

must be remembered that this material possesses an odour which, to most people, is highly disagreeable.

No further complaint regarding the conduct of hydrofluoric acid works has been received. A further improvement, in addition to those noted in last year's Report, has been effected at another works, whereby the exhaust gases are well cooled before being passed into the scrubber tower. The tower has worked more efficiently and, moreover, on account of the absence of steam, the escape is less noticeable.

Alkali Works in Scotland

In Scotland the number of works registered was 137, in which were operated 277 scheduled processes as follows: 6 alkali (saltcake), 1 alkali (wet copper), 2 smelting, 18 sulphuric acid, 12 sulphuric acid (Class II), 18 chemical manure, 14 gas liquor, 5 nitric acid, 88 sulphate and muriate of ammonia, 4 chlorine, 2 muriate acid, 11 sulphide, 1 alkali waste, 10 lead deposit, 1 arsenic, 5 nitrate and chloride of iron, 1 carbon bisulphide, 1 picric acid, 3 paraffin oil, 11 bisulphite, 62 tar, and 1 zinc extraction. Of the total quantity of ammonia produced (67,859 tons expressed as pure sulphate) 1,640 tons were obtained as concentrated liquor ammonia and 184 tons as ammonium chloride. Tar distilled totalled 182,026 tons; pitch produced amounted to 47,327 tons.

The competition of synthesised ammonia has been most severely felt by all works recovering ammonia as a by-product from coal and shale; indirectly, the makers of acids, no longer required to fix this ammonia, have also suffered. At one works registered for manufacture of sulphuric acid, sulphuric acid was concentrated without obtaining previously the additional registration necessary. Such an infraction of the Act some might think of small importance; but the unauthorised operation was performed so improperly that it caused public nuisance. After representations to the owners, the actions of their subordinates were promptly restrained and rectified, without enforcement by legal process.

At the alkali works, the production of hydrochloric acid and salt-cake has still further diminished. The general average amount of hydrochloric acid discharged into the air in each cubic foot of chimney gases was 0.05 grain, the highest and lowest averages for any one work being 0.1 and 0.02 respectively. So far as sulphuric acid is concerned, 14 per cent. less acid has been made by the chamber process, and fewer works have been in operation. Here a safe and useful method was noted of cleaning an acid store-tank. After running off all acid, the sludge remaining was flooded with dilute liquid ammonia; this washing liquid was then transferred to the saturator of a sulphate of ammonia plant. The general acidity in each cubic foot of residual gases discharged from sulphuric acid works was 0.5 grain of sulphuric anhydride—the highest and lowest averages for any one work were 0.89 and 0.2 respectively.

Scottish Chemical Manure Works

At the chemical manure works less raw material was dissolved for fertilisers. Great care was taken to maintain plant in good condition, and to operate properly. The gases evolved in this process require special precautions to render them innocuous owing to the large amount, often present, of silicon tetrafluoride, and it has been suggested, on competent authority, that the annoyance felt during last December in the Meuse Valley of Belgium was due to this same gas, evolved by the roasting of zinc blende. Condensation in the wash towers of different works varied from 100 to 97.3 per cent. The general average of the total acid in each cubic foot of gases escaping finally was 0.67 grain, expressed as the SO_3 equivalent of hydrofluosilicic acid.

There has been no cause for complaint against any of the sulphate and muriate of ammonia and gas liquor works. In such adverse conditions, they have done well, and plant has been kept in good repair and operations have been carefully supervised. Attention has been given to provide a suitable alternative to manufacture of sulphate by the preparation of ammonium carbonate, but experimental work on a large scale suggests that the product is easier to make than it will be to sell. A simple method of cooling "waste liquor" from ammonia stills, before delivery to the drain, is in use at Dunfermline Gas Works. A shallow basin some 12 ft. square has been provided in the open and lined with glazed bricks. Its floor is gently sloped, and the continuous flow of hot liquor is so distributed that in as wide and thin a layer as possible, it shall evaporate freely and run off cool.

British Overseas Chemical Trade in May

A Further Slight Improvement

ACCORDING to the Board of Trade returns for British overseas trade during May, 1931, exports of chemicals, drugs, dyes and colours totalled £1,728,879, which is £316,677 lower than May, 1930; imports at £1,020,687 are £200,805 lower than May, 1930; and re-exports at £88,345 have risen by £20,443.

The statistics for exports and imports during each of the past five months are set out below, showing percentage fall or rise on figures for the corresponding months of last year. From this analysis it will be seen that exports are now only

15.4 per cent. below May, 1930, a steady improvement having taken place since February of this year.

	Jan.	Feb.	Mar.	Apr.	May.
Exports ..	-36.5	-40.5	-30.5	-19.4	-15.4
Imports ..	-22.7	-11.3	-13.2	+4.8	-16.4

For the first five months of the present year exports have dropped £2,595,426, and imports have dropped £728,013 in comparison with the corresponding period of 1930.

	Quantities		Value			Quantities		Value	
	Month ended	May 31.	Month ended	May 31.		Month ended	May 31.	Month ended	May 31.
	1930.	1931.	1930.	1931.		1930.	1931.	1930.	1931.
Imports									
CHEMICAL MANUFACTURES AND PRODUCTS—									
Acetic anhydride ..cwt.	57	623	169	1,823	British West India Islands and British Guiana tons	1,475	1,567	12,172	11,014
Acid, Acetic	455	907	16,105	32,689	Other Countries tons	6,759	6,302	57,452	45,481
Acid, Tartaric	3,049	5,371	19,416	26,939	Total	41,915	55,751	348,877	397,054
Bleaching materials ..	6,609	3,907	12,335	7,460	Bleaching Powder (Chloride of Lime) ..cwt.	53,553	38,776	15,924	11,217
Borax	14,009	13,440	8,700	7,900	COAL TAR PRODUCTS, not elsewhere specified—				
Calcium carbide ..	71,989	55,149	42,941	33,365	Anthracene	—	—	—	—
Coal tar products, not elsewhere specified value	—	—	4,448	2,822	Benzol and Toluol galls.	9,603	6,602	1,421	557
Glycerine, Crude ..	4,235	—	6,423	—	Cwt.	—	—	—	—
Glycerine, Distilled ..	977	2,290	2,321	4,699	Carbolic Acid (Crude) ..	1,840	1,095	2,799	196
Red Lead and Orange Lead	4,023	1,804	6,042	2,609	Cwt.	—	—	—	—
Nickel Oxide	144	—	857	—	Carbolic Acid (Crystals)	1,350	1,246	4,596	3,311
Potassium Nitrate ..	13,048	6,470	12,602	6,243	Galls.	—	—	—	—
Other Potassium Compounds	158,544	106,134	53,668	43,780	Cresylic Acid	159,205	129,572	17,998	10,846
Sodium Nitrate ..	64,497	171,386	32,416	78,434	Naphtha	3,421	5,625	398	412
Other Sodium Compounds	29,477	37,342	19,031	20,676	Naphthalene (excluding Naphthalene Oil) cwt.	6,159	8,462	2,360	2,578
Tartar, Cream of ..	2,354	2,313	10,733	8,895	Tar Oil, Creosote Oil, etc.galls.	2,990,469	450,433	66,088	9,193
Zinc Oxide	1,370	682	30,915	15,185	Other Sorts	33,487	6,039	17,886	7,246
All other sorts .. value	—	—	260,551	239,153	Total .. value	—	—	113,546	34,339
DRUGS, MEDICINES, ETC.—					Copper, Sulphate	4,794	7,108	114,469	133,193
Quinine and Quinine Salts	156,534	90,276	12,057	6,834	Disinfectants, Insecticides, etc.cwt.	32,437	27,985	67,139	60,322
Bark Cinchona (Bark Peruvian, etc.) ..cwt.	2,110	1,309	9,826	5,380	Glycerine, Crude	5,410	1,275	10,285	1,560
All Other Sorts .. value	—	—	249,134	109,592	Glycerine, Distilled ..	3,903	7,413	10,276	19,065
DYES AND DYESTUFFS—					Total	9,313	8,688	20,561	20,625
Intermediate Coal Tar Products	225	—	2,620	—	POTASSIUM COMPOUNDS—				
Alizarine	44	37	1,954	1,912	Chromate and Bi-chromate	1,761	1,704	3,478	3,999
Indigo, Synthetic ..	—	—	—	—	Nitrate (Saltpetre) ..	1,083	1,293	2,039	2,297
Other Sorts	4,338	4,350	102,174	93,368	All Other Compounds cwt.	3,888	1,957	13,964	8,894
EXTRACTS FOR DYEING—					Total	6,372	5,224	19,481	15,190
Cutch	6,204	4,906	10,916	7,736	SODIUM COMPOUNDS—				
All Other Sorts ..	2,784	2,238	10,507	7,150	Carbonate, including Soda Crystals, Soda Ash and Bicarbonate cwt.	465,190	271,698	124,891	71,688
Indigo, Natural ..	34	100	945	2,900	Caustic	159,386	130,058	104,302	90,281
Extracts for tanning (solid or liquid) ..cwt.	93,622	92,957	91,818	92,944	Chromate and Bi-chromate	2,015	2,964	3,290	5,029
PAINTERS' COLOURS AND MATERIALS—					Sulphate, including Salt Cake	77,713	108,183	11,642	12,362
Barytes, Ground ..cwt.	47,194	45,391	9,906	9,274	All other Compounds cwt.	65,674	68,151	68,529	76,337
White Lead (dry) ..	10,753	14,921	27,530	20,721	Total	769,978	587,054	312,654	255,697
All Other Sorts ..	109,480	117,113	152,432	130,204	Zinc Oxide	270	401	8,858	9,086
Total of Chemicals, Drugs, Dyes and Colours	—	—	1,221,492	1,020,687	Chemical Manufactures, all Other Sorts .. value	—	—	319,239	226,463
Exports									
CHEMICAL MANUFACTURES AND PRODUCTS—					Total of Chemical Manufactures and Products .. value	—	—	1,356,642	1,174,556
Acid, Sulphuric	7,221	1,260	2,490	1,326	DRUGS, MEDICINES, ETC.—				
Acid, Tartaric	785	896	5,295	4,578	Quinine and Quinine Salts	116,704	113,959	11,566	11,985
Ammonium Chloride (Muriate)	484	345	8,109	5,466	All Other Sorts .. value	—	—	248,649	211,516
Ammonium Sulphate—					Total	—	—	260,215	223,501
To Spain and Canaries tons	11,353	8,526	89,948	59,693					
Italy	542	200	5,406	1,400					
Dutch East Indies tons	1,089	—	9,572	—					
China (including Hong Kong) tons	12,622	10,923	107,201	82,017					
Japan	8,075	28,233	67,126	197,449					

	Quantities Month ended		Value	
	May 31, 1930.	May 31, 1931.	May 31, 1930.	May 31, 1931.
DYES AND DYESTUFFS—				
Products of Coal Tar cwt.	12,118	9,954	95,362	102,363
Other Sorts	7,905	7,036	7,930	7,088
Total	20,023	17,590	103,292	109,451
PAINTERS' COLOURS AND MATERIALS—				
Barytes, Ground ..cwt.	1,022	2,259	536	1,092
White Lead (Dry) ..	4,493	3,214	8,744	5,398
Paints and Colours in Paste Formcwt.	34,242	25,376	67,943	45,662
Paints and Enamels Prepared (including Ready Mixedcwt.	48,254	32,285	153,413	100,314
All Other Sorts	68,299	39,179	94,771	68,905
Total	156,310	102,313	325,407	221,371
Total of Chemicals, Drugs, Dyes and Colours ..value	—	—	2,045,556	1,728,879
Re-exports				
CHEMICAL MANUFACTURES AND PRODUCTS—				
Acid, Tartaric....cwt.	79	63	650	401
Borax.....	384	445	223	237
Coal Tar Products, not elsewhere specified value	—	—	16	12
Potassium Nitrate (Salt-petre)cwt.	2,443	37	2,715	45
Sodium Nitrate ..	5,789	71,730	2,843	34,592
Tartar, Cream of ..	467	297	2,297	1,308
All Other Sortsvalue	—	—	18,772	11,086
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Saltsoz.	3,837	3,219	344	322
Bark Cinchona (Bark Peruvian, etc.) ..cwt.	254	1,057	2,458	6,854
All Other Sorts....value	—	—	27,172	24,724
DYES AND DYESTUFFS—				
Extracts for dyeing—				
Cutchcwt.	1,341	1,234	2,015	1,956
All Other Sorts....	97	432	602	1,682
Indigo, Natural ..	9	4	213	88
Extracts for tanning ..	1,784	979	2,396	1,423
PAINTERS' COLOURS AND MATERIALS	2,684	1,641	4,709	3,439
Total of Chemicals, Drugs, Dyes and Colours ..value	—	—	67,902	88,345

European Benzole Producers Standardisation of Quality

THE fourth plenary meeting of the International Conference of Benzole Producers took place on Friday, June 12, at Hamburg, at which were present delegates from Great Britain and the Continent. The delegates of Great Britain were Sir David Milne-Watson, president of the National Benzole Association, and many directors of the National Benzole Company, Ltd.

The producers of benzole have made an arrangement to standardise methods of test for all grades of benzole in order to establish uniformity of quality of motor and industrial benzole by the European producers. This will go a long way towards protecting the users from inferior grades of benzole being placed on the market. Market conditions of motor benzole and petrol were discussed.

Markets for Pharmaceutical Chemicals

A CONFIDENTIAL report on the market for pharmaceutical chemicals in Denmark has been prepared by the Department of Overseas Trade from information furnished by the Commercial Secretary to H.M. Legation at Washington and issued to firms whose names are entered on its Special Register. United Kingdom firms desirous of receiving a copy of this report, together with particulars of the Special Register service of information and form of application for registration, should communicate with the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. Reference number F.X. 1139 should be quoted.

Chemical Production in Canada Statistics for 1930

CHEMICAL production in Canada during 1930 showed a decline of 12 per cent. in value from the total for the preceding year, according to preliminary figures issued by the Dominion Bureau of Statistics at Ottawa. The output value in 1930 was \$122,266,852 as compared with \$138,545,221 in 1929. The 1930 total, however, was only slightly below the corresponding value for 1928 and exceeded the average for the past five years by \$1,379,159.

For statistical purposes, the chemical industry has been divided into fifteen main groups; and in 1930 only two of these groups showed a higher production value than in the previous year. The fertilisers industry, covering those concerns engaged chiefly in the manufacture of mixed fertilisers, showed a gain of 12 per cent. and adhesives increased 5 per cent. The paint industry which, from point of value, was the most important of the chemical group, declined 9 per cent.; acids, alkalies and salts dropped 30 per cent.; pharmaceutical preparations showed a reduction of 4 per cent.; soaps and washing compounds, 5 per cent.; explosives and fireworks, 10 per cent.; and the miscellaneous group, 12 per cent. The toilet preparations group declined 5 per cent.; coal tar distillation products, 12 per cent.; compressed gases, 10 per cent.; inks, 15 per cent. flavouring extracts, 5 per cent.; wood distillation products, 13 per cent.; and polishes and dressings, 4 per cent.

Of the total imports amounting to \$36,785,050 in 1930, about 65 per cent. were from United States, 13 per cent. from the United Kingdom, 10 per cent. from Germany, 4 per cent. from France, 3 per cent. from the Netherlands, 2 per cent. from Belgium, 1.5 per cent. from Chile, and the remaining 1.5 per cent. from other countries. Of the total exports amounting to \$16,320,507, over 55 per cent. was sold to United States and 20 per cent. to the United Kingdom.

Chemical Import Trade of India Statistics for 1930-31

ACCORDING to *A Survey of the Import Trade of India*, which has been prepared by H.M. Trade Commissioner at Calcutta (copies of which may be obtained from the Department of Overseas Trade, quoting Ref. C. 3570), the total trade in chemicals during the year ended March 31, 1931, declined from Rs. 278½ lakhs to Rs. 261¼ lakhs. The principal items included under this heading and in the section relating to drugs are:—

	1930-31 Rs. (lakhs)	1929-30 Rs. (lakhs)
Acids	10	10½
Caustic soda	27½	21½
Sodium carbonate	64½	71
Sulphur (brimstone)	18½	20½
Camphor	27	31½
Quinine salts	23	28½

Total imports of alizarine dyes declined from 5,327,655 lbs., valued at Rs. 27 lakhs, to 3,241,287 lbs., valued at Rs. 16½ lakhs. The United Kingdom's proportion was reduced from 1,404,684 lbs. to 723,741 lbs. Imports from Germany totalled 2,369,593 lbs., as compared with 3,584,571 lbs. in the previous year. Aniline dyes declined from 13,319,441 lbs. to 12,828,889 lbs., but the value increased from Rs. 160½ lakhs to Rs. 181 lakhs. Imports from the United Kingdom were 821,045 lbs., as compared with 989,614 lbs. in the previous year. Imports from Germany increased from 9,171,076 lbs. to 9,494,354 lbs. The next largest supplier was the United States, whose quantity was reduced from 1,510,606 lbs. to 1,165,993 lbs.

Government Contracts in Central America

A MEMORANDUM dealing with the general conditions governing tenders for Government Contracts in Costa Rica and in Salvador, prepared from information furnished by His Majesty's Consuls at San Jose and San Salvador, has been issued by the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1, from whom copies may be obtained on application quoting reference C.X. 3568.

By-Products from Bituminous Coal

Recent Developments in the United States

IN summarising the trends and recent developments in the by-product coking of coal, so far as the United States is concerned, Dr. A. C. Fieldner,* chief engineer of the experiment stations of the United States Bureau of Mines, points out that there is to be noticed a steady gain in the value and yield of by-products during the last fifteen years.

Referring to the utilisation of hydrogen in coke-oven gas for the production of synthetic ammonia as a project for utilising excess gas, Dr. Fieldner says that the Ruhr-Chemie A.G., a combination of 20 coke-oven operators of the Ruhr district, have now partly completed plants with a total proposed annual capacity of approximately 200,000 metric tons of fixed nitrogen. Some 30,000 tons was produced in 1929, and it was expected that the 1930 production would reach 80,000 tons, but the present world-wide over-production of fixed nitrogen may discourage completion of the original plan. Similar plants for producing synthetic ammonia from the hydrogen in coke-oven gas have been installed in Belgium and France, where the hydrogen from carbonising 1 ton of coal yields approximately 110 lb. of fixed nitrogen as ammonia, compared to 5.3 lb. recovered from the gas in the usual by-product plant. The most complete chemical utilisation of coke-oven gas, however, has probably been made at Bethune in France. Here, ammonia, methanol, ethyl alcohol and ethyl ether have been produced from the hydrogen, carbon monoxide and ethylene in the gas after separating them in a Claude liquefaction and fractional distillation plant, and it is reported that a fourth unit, capable of making 20 tons of ammonia and 1½ tons of methanol daily, has been completed recently.

Sulphur Recovery Processes

The recovery of sulphur in marketable quantities in connection with gas purification is one of the notable achievements of recent years. Several plants in the United States have installed such processes. In 1929, the average recovery was 2.6 lb. of sulphur per ton of coal carbonised and the sales value as ordinary brimstone was approximately \$18 a ton.

Activated charcoal, similar to that used in gas works, is one of the newer solid absorbents used for purifying gases from sulphur compounds and is used by the German I.G. at the Leuna synthetic ammonia plant. It has the advantage of absorbing organic sulphur compounds as well as hydrogen sulphide, and permits the recovery of free sulphur. The gas, to which has been added sufficient air to oxidise the hydrogen sulphide to free sulphur and a very small amount of ammonia, is passed through cylindrical tanks containing the activated charcoal, and when a tank becomes saturated with sulphur it is cut out from the gas circuit and the free sulphur is extracted with ammonium sulphide. After the sulphur is extracted the tank is steamed to remove the last traces of solution and regenerate the charcoal for the next cycle of absorption. The ammonia is then distilled out of the polysulphide solution for use in further extraction of charcoal, leaving the free sulphur behind.

In the Ruhr iron oxide process the gas is passed through large ferro-concrete boxes, from which the oxide when saturated can be removed through a bottom discharge or from the top with grab buckets. The sulphur is extracted from the oxide with ammonium sulphide in the same manner as in the activated carbon process, and the spent oxide is then treated in the usual manner for the recovery of cyanogen compounds. Using this process about 20,000 tons per annum of almost pure sulphur is being recovered by the Ruhr-Gas A.G.

Phenols from Still Wastes

Another important instance of solving a troublesome waste problem with partial credit from a saleable by-product is the dephenolising of ammonia still wastes. Most coke-oven plants use the direct system of ammonia recovery, and such plants produce an average of 30 gallons of still waste per ton of coal carbonised, whilst plants using the indirect system produce about 99 gallons per ton. Total phenols (including cresols and other phenol derivatives) in such ammonia still wastes from direct recovery plants averages about 2 grams per litre (0.017 lb. per gallon).

Three different processes have been developed for removing the phenols from this waste water. In the Hefner-Tiddy process advantage is taken of the volatility of ammonium

phenolate. The ammonia liquor is preheated to 98° C., or higher, and enters the still counter-current to the ammonia gas leaving the still; ammonium phenolate is thus formed in the vapour state and goes on into the gas or can be scrubbed out with caustic solution. In the Koppers vapour recirculation process the hot liquor from the free ammonia still is sprayed down a tower against an ascending stream of steam and gas, or air, which vaporises the phenols and carries them out of the liquor, which is then returned to the fixed ammonia still. The phenol-bearing vapours are then scrubbed with caustic soda solution in another part of the cycle forming sodium phenolate from which phenol may be recovered by treatment with carbon dioxide or sulphuric acid. In the solvent extraction process the ammonia liquor before entering the still is subjected to a countercurrent extraction with benzol or light oil, when the phenols dissolve in the benzol, which is in turn extracted with sodium hydroxide solution, forming sodium phenolate, from which phenol is produced by treatment with acid or carbon dioxide.

The amount of saleable phenols recovered varies with the type of recovery process used and coke-oven plant conditions. An average figure for American plants is 0.35 lb. per ton of coal carbonised. In the Ruhr district of Germany twelve dephenolising plants are treating 528 million gallons of ammonia liquor annually and producing 6,600,000 lb. of phenol.

Benzol and Light Oils

The principal recent improvement in benzol recovery has been in the refining process, activated carbon and other solid absorbents having been tried as a substitute for oil absorption at certain plants without practical success.

In washing benzols with sulphuric acid to remove gum-forming constituents, it is recognised that appreciable quantities of light oil are lost due to the drastic action of the strong acid. Progress has been made in Europe in reducing this loss by using a limited amount of less concentrated sulphuric acid, but, in the United States a new process of benzol washing known as the "Ufer" process has been adopted at the plant of the Hamilton Coke and Iron Co., Hamilton, Ohio. This process avoids the production of the usual "acid sludge" the disposal of which is difficult and from which the spent acid cannot be recovered readily; it also reduces light-oil losses. In this process, after the benzols have been agitated with sulphuric acid of a suitable strength, a certain amount of water is added to the agitator, agitation is then continued, after which the mixture is allowed to settle. Due to the addition of water, no sludge results, but instead the resins remain dissolved in the light oil, leaving a clear sulphuric acid below, which is suitable for further use in the ammonium sulphate saturator. On distillation of the light oil, the resins then remain in the still residue.

Hydrogenation of Coal Tar

Inasmuch as 50 per cent. of the tar produced in the United States is burned as a fuel, its value is set by the market price of the fuel oil with which it must compete. This situation would also hold true with low-temperature tar if it were produced in commercial quantities, and although considerable research has been done on finding new uses for low-temperature tar, no real commercial success has yet been achieved. A large part of low-temperature tar, however, consists of hydrocarbons similar to those found in petroleum, and it is therefore amenable to cracking for the production of motor fuels, whilst it can also be hydrogenated by the Bergius process in the same way as petroleum.

It is reported that the I.G. organisation in Germany is producing 100,000 tons per annum of synthetic gasoline by hydrogenating lignite tar. In the United States the Standard Oil Co., New Jersey, joined with the I.G. in the further development and commercialisation of this method as applied to the conversion of heavy oils and residues to gasoline and the production of high-grade lubricating oil. Extensive research has been conducted and is still in progress in simplifying the equipment and broadening the process.

Proposed Nitrate Plant in Mexico

THE Department of Agriculture of the State Government of Vera Cruz (Mexico) has proposed the establishment of a plant for the fixation of atmospheric nitrogen for making fertilisers for distribution among farmers of the State at low prices. The proposal is to make fertilisers so as to avoid the necessity of importing commercial fertilisers. A company is to be formed in which the taxpayers are to be invited to subscribe for stock.

* U.S. Bureau of Mines, Report of Investigations 3079.

Magnesium Compounds in the United States

By Paul M. Tyler

The following article is abstracted from Information Circular 6406, recently issued by the United States Bureau of Mines. It briefly surveys the uses of all magnesium compounds other than magnesite, and affords an insight into statistics which are available for the United States. It will be noticed that imports of magnesium carbonate and calcined magnesia are chiefly from Britain, whilst Germany is the principal source of sulphate and chloride.

BEFORE the World War a large part of the magnesium compounds used in the United States were imported from Europe; the remainder was made principally from crude magnesite which was imported from Greece. Following the passing of the Tariff Act in 1922, caustic calcined magnesite was used instead of crude magnesite by many chemical manufacturers, and according to figures obtained by the United States Tariff Commission, it appears that the annual consumption of caustic magnesite for purposes other than stucco and flooring is distributed approximately as follows:—

	Short tons.
Rubber trade	800
Insulation	1,100
Chemicals	4,300
Undetermined	2,500

The quantity of dolomite sold or used by producers in the United States for the manufacture of basic magnesium carbonate during the last five years has averaged 84,000 short tons. In addition crude dolomite has been employed for the manufacture of carbon dioxide, which may be considered a chemical use. Figures covering the consumption of dolomite for this latter purpose after 1926 are not available, but in that year 16,520 tons of dolomite, valued at \$31,424, were sold by domestic producers for the manufacture of carbon dioxide.

Next to the United States, Germany is undoubtedly the largest producer of magnesium salts. In 1929 it was reported that 42,999 metric tons of magnesium chloride and 100,869 metric tons of magnesium sulphate were produced as by-products of the potash industry; the corresponding figures for 1928 were 36,585 tons and 93,942 tons, respectively.

Precipitated Magnesium Carbonate

Magnesium carbonate is a white, bulky powder, insoluble in water. The ordinary grade, known as technical carbonate, is a basic carbonate, the composition of which varies according to the method of manufacture, but is approximately expressed by the formula, $4\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 5\text{H}_2\text{O}$. The ordinary variety produced is a "light carbonate" (terra alba levis), but by varying the method of manufacture a denser form or "heavy carbonate" (terra alba ponderosa) may be obtained; this latter compound contains one molecule of water less than the light carbonate. In the United States, at least 90 per cent. of the output is used in the form of non-heat-conducting coverings for steam pipes, boilers, and all kinds of heated surfaces; the remaining 10 per cent. is used directly in the rubber trade as an accelerator, and as a constituent of paints and certain pharmaceutical preparations. Minor quantities enter into the composition of glass, printing ink, cosmetics and tooth paste.

In England and in the United States the bulk of the production of magnesium carbonate is made from dolomite by the method originally patented by Pattinson. The raw dolomite mixed with coke is lightly calcined in a kiln and then treated with water and carbon dioxide under a pressure of 5 to 6 atmospheres for a fairly long period. The newly formed carbonate of magnesia is thereby converted into the soluble bicarbonate, and as long as any magnesium carbonate remains undissolved, the calcium carbonate remains unattacked and may be separated by filtering. By boiling the filtrate and removing the carbon dioxide, magnesium carbonate is precipitated and subsequently removed and dried. The carbon dioxide required for the process is furnished by the kilns, and the calcium carbonate removed by the first filtration is sold for use as "precipitated chalk."

Manufacturers of basic magnesium carbonate in the United States do not report their output of finished products, but for a number of years the crude dolomite used for this purpose has been reported to the Bureau of Mines. On the basis of these figures, making a rough estimate to cover the production of carbonate from magnesite and sources other than dolomite, it appears that the dolomitic output of technical carbonate ranges from 50,000 to 75,000 short tons annually.

The industry is centred in Pennsylvania, New Jersey, Ohio and California. The manufacturers of the carbonate utilise most of their product in their own plants for the manufacture of boiler coverings and moulded insulations. The same manufacturers also produce a variety of asbestos goods and similar heat-resisting materials.

Statistics for imports of precipitated magnesium carbonate for 1919 to 1929 are set out below. The principal source of these imports is England; smaller quantities are derived from Germany.

IMPORTS OF MAGNESIUM CARBONATE INTO THE UNITED STATES.

Year.	Weight (lb.)	Value.	Cents per lb.
1919	5,094	\$ 1,101	21'6
1920	14,930	1,512	10'1
1921	18,514	2,061	11'1
1922	36,254	3,385	9'3
1923	1,046,990	55,137	5'3
1924	481,439	25,333	5'3
1925	199,413	13,004	6'8
1926	241,293	10,142	6'7
1927	348,383	20,115	5'8
1928	283,264	17,512	6'2

Magnesium Sulphate

Magnesium sulphate with seven molecules of water—described as Epsom salts, bitter salt, Lemery's salt, salts of England, etc.—forms small colourless prisms or needles, has a bitter, saline taste, and is soluble in water but insoluble in alcohol. The melting point is $70^\circ \text{C}.$; at 150° to $160^\circ \text{C}.$ it loses 6 molecules of water, and at about $280^\circ \text{C}.$ it becomes anhydrous. The anhydrous salt is a heavy, white, amorphous powder which is insoluble in water and even in dilute acids; its specific gravity is 4.4.

The largest use for purified magnesium sulphate is in the drug trade and in the manufacture of laxative mineral waters. Commercial grades are used for sizing textiles, and for weighting silks, paper and leather, and in the manufacture of artificial silks by the viscose process. According to a report from the United States Consul in Germany, 4 to $4\frac{1}{2}$ tons of the salt is consumed for every ton of finished rayon. Minor uses include the manufacture of poultry food, bath salts, dry colours, printing inks and standardising dyes.

In Germany, magnesium sulphate is manufactured on a large scale from kieserite. At Stassfurt the crude kieserite is first washed with water to remove the chlorides of magnesium and sodium, being suspended on large sieves standing in tanks of water. Here the kieserite powder falls through the meshes of the sieves, whilst gangue and other impurities, including anhydrite and large lumps of rock salt, remain behind on the sieves. The powder is then packed in conical wooden moulds in which it sets to a compact mass containing 80 to 90 per cent. of Epsom salts and only 1 or 2 per cent. of sodium chloride. A large quantity of this material is marketed, but the remainder is purified by recrystallisation and sold as Epsom salts.

In the United States magnesium sulphate is produced by five companies, but the only magnesium sulphate produced from natural salts and bitter waters is the product of the Dow Chemical Co. at Midland, Mich. The process employed in the case of bitters, which is a mixture of calcium and magnesium chlorides, has been described by H. H. Dow, *Ind. Eng. Chem.*, February, 1930.

The total domestic output from all sources in the United States in 1927 was 27,665 short tons. Prior to the war the imports ranged from 3,631,245 pounds in 1908 to 13,549,599 lbs. in 1914; this quantity dropped to only 2,045 lbs. in 1918. Imports since 1919 have come chiefly from Germany and now average 10,000,000 to 13,000,000 lbs. annually. According to the United States Tariff Commission a comparison of the unit values of domestic production and imports indicates that the domestic production is mainly of the U.S.P. grade, whereas imports consist mainly of the commercial or technical grade.

The Tariff Act of 1922 increased the duty on magnesium

sulphate from 1/10 cent per pound to 1/2 cent per pound; under the Act of 1930 the rate is 3/4 cent per pound.

Calcined Magnesia or Magnesia Oxide

Calcined magnesia is formed by heating the precipitated carbonate at a moderately high temperature. It is a white, fluffy powder, insoluble in water but soluble in acids. Technical grades are used as an insulating material and in compounding rubber. For certain purposes specially selected magnesite may be used, and such material may be described as "calcined magnesia, heavy." For other grades the raw material is virtually the same as the basic carbonate used by the magnesia insulation manufacturers. The specific gravity is normally 3.07 to 3.2, but may be increased to 3.61 by continued heating.

Before the war imports of calcined magnesium fluctuated from less than 50,000 to more than 110,000 pounds annually. Since 1922 imports have generally increased. A maximum of 520,394 pounds was reached in 1926, but the value per pound in that year being substantially below normal, the maximum value was reached in 1929, when 471,545 pounds valued at \$83,866 were imported. The imports are mainly from England, and to a less extent from Germany.

IMPORTS OF CALCINED MAGNESIA INTO THE UNITED STATES.

Year.	Weight (lb.)	Value	Cents. per lb.
1919	22,637.	\$ 11,358	50.2
1920	26,859	9,093	33.9
1921	35,182	7,593	21.6
1922	96,792	15,969	16.5
1923	141,375	30,802	21.8
1924	101,998	29,252	28.7
1925	162,790	43,356	26.6
1926	520,394	51,454	9.9
1927	259,357	48,093	18.5
1928	300,897	60,325	20.0
1929	471,545	83,866	17.8

Magnesium Chloride

Magnesium chloride usually crystallises with six molecules of water ($\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$). It becomes entirely fluid when heated to 118°C ., but even at 105° it loses some hydrochloric acid. It is impossible to prepare the anhydrous salt by simple heating. About one-third of the water may be expelled without carrying off chlorine, but the tendency to form basic salts can be prevented only by carrying on the dehydration in an atmosphere containing ammonium chloride, hydrochloric acid, or other substance that inhibits the loss of chlorine. Solvay, however, patented a process for heating the hexahydrated salt at 120°C . until 80 per cent. of water was expelled, leaving a residue which could be further heated without much loss of hydrochloric acid. The anhydrous chloride forms white transparent masses, specific gravity 2.177.

There are at least six different hydrates of magnesium chloride ranging from a salt with 12 molecules of water of crystallisation to one containing only 1 molecule of water of crystallisation (obtained only by passing dry hydrogen chloride over the tetrahydrated salt). The six-molecule salt, however, is the one that normally crystallises from aqueous solution. Technical grades are now furnished in the crystal, fused, flake, and powder forms. It has also been marketed extensively in the form of a concentrated solution or "liquid," but at present practically all the important domestic product is sold in flake or powder form; in the flaking process some of the water of crystallisation is removed.

Anhydrous magnesium chloride serves as raw material for the manufacture of metallic magnesium. The hydrated salt with six molecules of water of crystallisation is used chiefly with calcined magnesite in the preparation of oxychlorid (Sorel) cements, as employed for jointless flooring, stucco, and to a more limited extent in other products, notably artificial woods. Minor uses include the treatment of textiles (sizing, dressing, and filling of cotton and woollen fabrics, thread lubricant, wool carbonisation), disinfectants, fire extinguishers, fire-proofing wood, refrigerating brines (due to non-splashing properties), ceramics, chilling drilling tools, paper manufacture, and road dust-laying preparations.

The bulk of the world supply of magnesium chloride is derived from residual liquors, from the extraction of potash (in Germany) or from common salt bitterns. At Stassfurt the hydrated salt is recovered after extracting potassium chloride by evaporating the mother liquor until its specific gravity is about 1.375, then it is cooled and crystallised. In Michigan, U.S.A., the magnesium chloride, the brine from salt wells

(which contains approximately 14 per cent. NaCl , 9 per cent. CaCl_2 , 3 per cent. MgCl_2 , and 0.15 per cent. bromine) is first treated for bromine and then with a magnesium hydrate slurry to precipitate the iron and other impurities which are separated in continuous thickeners and sedimentation tanks. The decanted liquor is evaporated until the sodium chloride has crystallised and this salt is then removed on rotary filters. The MgCl_2 and CaCl_2 in the mother liquor are next separated from each other by fractional crystallisation.

Dehydrated Magnesium Chloride

In order to use this material in the electrolytic cells for the manufacture of magnesium metal, it must be dehydrated. Carefully controlled air-drying on the counter-current principle produces a composition corresponding approximately to $\text{MgCl}_2 \cdot 2\text{H}_2\text{O}$, and the last two molecules of water are removed by heating to still higher temperature in an atmosphere of hydrochloric acid, which prevents hydrolysis and the formation of magnesia. In Germany anhydrous chloride for the manufacture of magnesium metal is made by the interaction between magnesium oxide and chlorine gas in the presence of carbonaceous matter.

Magnesium chloride was not produced in the United States until after the outbreak of the World War, but when imports from Germany were cut off, a large domestic industry was developed, chiefly as an offshoot of the salt industry in Michigan and California. There are usually less than three producers. The latest statistics which are available show that the total sales of flake chloride in 1926 amounted to 45,630,000 pounds valued at \$674,680 (equivalent to 1.48 cents per lb.); in addition 6,939,000 pounds of chloride were produced in liquid form, ranging from 23° to 36°Bé ., and sold as road liquor at an average price of 0.39 cents per lb. In that year the output came from four companies.

Germany is the chief source of imports. Production in Germany increased from 88,184,000 lbs. of the solid and liquid forms in 1913 to 176,368,000 lb. in 1926, equal to three times the production in the United States. In 1929 the German output was about 35,000 tons of solid salt and about 60,000 tons of liquor having an aggregate value of 3,700,000 marks. British India is another large producer. In 1909 Italy produced 3,252,480 pounds of magnesium chloride.

As a result of the declining use of magnesite cements in recent years, the demand for chloride for flooring and stucco has undoubtedly fallen off substantially from the high figures registered between 1923 and 1926. The price of flake chloride in barrels f.o.b. U.S. works has been \$36 to \$37 per short ton for five years or more. Imported chloride (fused) in barrels, was quoted at \$26 a ton in 1924-25, but since May, 1926, has been selling generally for about \$31.75 to \$33.50 in New York. Domestic fused chloride usually sells for about \$2 a ton less than flake, but higher than the imported material. As previously noted domestic chloride is purer and contains substantially more MgCl_2 than the German product.

Minor Salts of Magnesium

Various other magnesium salts are of more or less commercial importance. Most of these minor compounds are used exclusively in medicine, but a number of them have other uses. The borate, $\text{BMgO} \cdot \text{B}_2\text{O}_3$, for instance, is used as a preservative; the nitrate is used in pyrotechnics; the oleate, perborate and stearate as varnish driers.

Magnesium fluoride, MgF_2 , is employed in ceramics; the silico-fluoride or fluosilicate, MgSiF_6 , as a concrete hardener. Magnesium silicate, $3\text{MgSiO}_3 \cdot 5\text{H}_2\text{O}$, is used extensively in the rubber industry, in paints and varnishes (as pigment and filler), in glass and clay wares, in refractories, in the manufacture of permanently dry resinous compositions, and as a bleaching agent for animal and vegetable oils; it is made by the interaction of a magnesium salt and sodium silicate but much of the product sold as magnesium silicate is merely pulverised natural talc.

Magnesium hydroxide, made by precipitating a solution of any of the salts by means of sodium hydroxide, is used in sugar refining, and in medicine. The peroxide, MgO_2 , is a general bleaching and oxidising agent and is used especially in bleaching woollen and silk fabrics, and as an antiseptic. It is made from sodium or barium peroxide and magnesium sulphate (in concentrated solution) and is packed in drums. Magnesium tungstate, produced from magnesium sulphate and ammonium tungstate, is used in luminescent paints and in fluorescent screens for X-ray work.

Preparation of Synthetic Resins from Alkali Lignin

By Max Phillips and Herman D. Weihe

Synthetic resins have been prepared by condensing lignin with furfural and with the following aromatic amines: aniline, o-toluidine, p-toluidine, cymidine, o-nitraniline, p-nitraniline, dimethylaniline, m-toluylenediamine, benzidine, tolidine, α-naphthylamine, and β-naphthylamine. A study of the optimum conditions for preparing these resins has been made. Some of the more important properties and possible uses for these resins are described by the authors in "Industrial and Engineering Chemistry."

ALTHOUGH the problem of the utilisation of lignin has for some time engaged the attention of a great many investigators, it is still largely unsolved. Naturally most of the workers have concentrated on developing uses for the lignin in the waste liquors from the wood-pulp mills, as this constitutes the principal industrial source of lignin (1).

During the past three years investigations have been under way in this bureau on the chemistry of lignin, particularly that isolated from annual crop plants (2 to 5). As a result of that work the possibility of utilising lignin in the preparation of synthetic resins suggested itself. Accordingly, the investigation recorded in this paper was undertaken and carried out at the Bureau of Chemistry and Soils, Washington.

Experimental Procedure

The lignin used in the various experiments described in this paper was isolated from corncocks by the alkali method.

In order to determine the optimum conditions for the preparation of each resin, it was necessary to determine experimentally the following three factors: (1) optimum temperature, (2) optimum ratio of lignin to the second component (concentration), and (3) optimum time of heating.

Several preliminary experiments were first conducted for the purpose of determining the temperature at which lignin would react with the organic compound selected, to yield a resinous condensation product. Keeping the preliminary temperature thus determined constant and temporarily adopting one hour as the time of heating, experiments were conducted in which the concentration of the aromatic amine or furfural with respect to the lignin was the sole variable. Having thus determined the optimum concentration, experiments were then conducted in which the concentration and temperature were kept constant and the time of heating varied. Adopting a similar mode of procedure, the optimum temperature was determined.

The optimum methods for preparing the various resins, as well as their most important physical properties, are given below. All reactions were carried out under ordinary atmospheric pressure unless otherwise indicated. The quantities of materials used are all expressed as parts by weight.

Condensation with Aromatic Amines

ANILINE.—Two parts lignin and 1 part aniline were heated at 150° C. for 1 hour. A dark brown, hard and brittle resin was obtained. When hydrochloric acid was added to the reaction mixture or, what amounts to the same thing, when aniline hydrochloride was used in place of the aniline, no improvement in the resin obtained could be observed.

o-TOLUIDINE.—Two parts lignin and 1 part o-toluidine were heated at 170° C. for 1 hour. A black, hard resin having a rather glossy surface was obtained.

p-TOLUIDINE.—Three parts lignin and 2 parts p-toluidine were heated for 1 hour. The resin obtained was black, brittle, and lustrous.

CYIMIDINE (1-METHYL-2-AMINO-4-ISOPROPYL BENZENE).—To equal parts lignin and cyimidine 1 part concentrated hydrochloric acid was added, and the mixture was heated for 1 hour at 150° C. A hard, brittle resin was obtained.

o-NITRANILINE.—Equal parts of lignin and o-nitraniline were heated for 1 hour at 150° C. A very tough, black, lustrous resin was obtained.

p-NITRANILINE.—Equal parts of lignin and p-nitraniline were heated for 1 hour at 150° C. A bluish black, very tough resin was obtained.

DIMETHYLANILINE.—The dimethylaniline resin may be prepared either by heating 2 parts of lignin and 1 part dimethylaniline at 170° C. for 1 hour, or by heating 3 parts lignin and 2 parts dimethylaniline at 150° C. for 1 hour. In either case a very tough, black resin is obtained. The resin contracts on cooling and does not stick to glass, so that it can be readily moulded in glass tubes.

m-TOLUYLENEDIAMINE.—Equal parts of lignin and m-toluylenediamine were heated for 1 hour at 150° C. A black, hard, brittle, lustrous resin was obtained.

BENZIDINE.—Equal parts of lignin and benzidine were heated at 200° C. for 1 hour. A dark brown, lustrous resin was obtained.

TOLIDINE.—One part of lignin and 2 parts tolidine were heated at 170° C. for 1 hour and a black, hard, lustrous and tough resin was produced.

α-NAPHTHYLAMINE.—Two parts lignin and 1 part α-naphthylamine were heated at 150° C. for 1 hour, and a hard, black, and rather brittle resin was obtained.

β-NAPHTHYLAMINE.—Equal parts lignin and β-naphthylamine when heated at 150° C. produced a black resin having properties similar to that obtained from α-naphthylamine.

Resins from Lignin and Furfural

HYDROCHLORIC ACID AS CATALYST.—Three parts of lignin, 5 parts furfural, and 1 part concentrated hydrochloric acid when heated at 80° C. for 1 hour produced a hard, black, lustrous and tough resin. This product differed entirely in its physical properties from the resin obtained by heating furfural with hydrochloric acid. The reaction product did not contain uncombined lignin.

SODIUM CARBONATE AS CATALYST.—Ten parts lignin, 5 parts furfural, and 0.5 part dry sodium carbonate were heated in a sealed glass tube at 150° C. for 1 hour. A black, hard, lustrous and somewhat brittle resin was obtained.

PYRIDINE AS CATALYST.—Ten parts lignin, 5 parts furfural, and 1 part pyridine were heated in a sealed tube at 150° C. for 1 hour. The resin was black and plastic.

CALCIUM OXIDE AS CATALYST.—Ten parts lignin, 5 parts furfural, and 1 part calcium oxide were heated in a sealed tube at 150° C. for 2 hours. The resin was similar to that obtained when sodium carbonate was used as the catalyst except that it was somewhat softer.

Solubility of Resins

All the resins prepared from lignin and aromatic amines are fusible and readily soluble in mixtures of organic solvents, such as a mixture of furfural, benzene, and 95 per cent. ethanol (1 : 1 : 1 by volume); or ethanol and benzene (1 : 1 by volume); and acetone and benzene (1 : 1 by volume). They are less soluble in the pure solvents themselves and in mixtures of 95 per cent. ethanol and p-cymene, or methanol and p-cymene (1 : 1 by volume). All the resins are readily soluble in furfural.

The resins prepared from lignin and furfural, in the preparation of which basic catalysts were used, were all soluble in the above-mentioned solvents. On the other hand, the furfural-lignin resin which was prepared using the hydrochloric acid catalyst was of the insoluble and infusible type.

Applications

The soluble resins described above were each dissolved in 1 : 1 ethanol (95 per cent.)-benzene solution, sufficient resin being used to make approximately 10 per cent. solutions, and applied with a brush on white oak. After the first coat was entirely dry, a second coat was similarly applied. The appearance of the coats of varnish on the wood is shown in Table I.

A number of experiments were also carried out with the view of determining the feasibility of using the resins as binders in the preparation of compressed boards from paper. The general method consisted in making up solutions of the resins in 1 : 1 : 1 ethanol-benzene-furfural solution and impregnating large sheets (6 by 18 in.) of filter paper. These sheets were allowed to dry, then cut into 6-inch squares and placed in an electrically heated hydraulic press which was heated to 150° C. and subjected to a pressure of 16,000 pounds per square inch (1125 kg. per sq. cm.) for about 1 hour. The resin prepared from dimethylaniline and lignin was found to give the most promising results. A compressed board was

obtained having a polished finish and considerable strength. It appeared to be inferior, however, to a board similarly prepared in which furfural-phenol resin was used as the binding material. The other resins tested appeared to be unsuitable for this purpose.

TABLE I.—APPEARANCE OF LIGNIN RESINS WHEN APPLIED AS VARNISHES TO WHITE OAK.

Resin	Shade Given by 2 Coatsof Resin in 10 per cent. 1 : 1 Ethanol-Benzene Solution.
Lignin-aniline	Reddish brown
Lignin-o-toluidine	Light brown
Lignin-p-toluidine	Mahogany or dark brown
Lignin-cymidine	Dark brown
Lignin-o-nitraniline	Mahogany
Lignin-p-nitraniline	Dark brown
Lignin-dimethylaniline	Dark brown
Lignin-n-toluylenediamine	Light brown
Lignin benzidine	Yellowish brown
Lignin-tolidine	Light brown
Lignin- α -naphthylamine	Reddish brown
Lignin- β -naphthylamine	Brown
Lignin-furfural + Na ₂ CO ₃ as catalyst	Mahogany
Lignin-furfural + pyridine as catalyst	Dull brown
Lignin-furfural + CaO as catalyst	Brown

REFERENCES.

- (1) Johanson and Hovey, Canadian Dept. of Interior, Forestry Branch. *Bull.* **66** (1919).
- (2) Phillips, *J. Am. Chem. Soc.*, **49**, 2037 (1927).
- (3) Phillips, *Ibid.*, **50**, 1986 (1928).
- (4) Phillips, *Ibid.*, **51**, 2420 (1929).
- (5) Phillips, *Ibid.*, **52**, 793 (1930).

The Chemistry of Food Deterioration

Annual Report of the Food Investigation Board

THE significance of chemical investigations in the improvement of certain food supplies is revealed in the annual report of the Food Investigation Board, Department of Scientific and Industrial Research, for 1930.

Deterioration in Apples

While studying the diseases of apples in cold storage it has found that healthy fruit absorbed acetaldehyde, and, at the same time, protection from the attack of fungi was afforded. Important observations have been made on the presence of vitamin C, in the course of work carried out in collaboration with the Medical Research Council at the Lister Institute, and it has been found that the vitamin content of the peel is at least six times that which exists in the region of the core. The chemistry of the ripening of the apple, whilst in growth on the tree and in storage, and the resistance of apples to infection by fungi, is being investigated, on behalf of the Board, at the Imperial College of Science and Technology, South Kensington.

At the Low Temperature Research Station, Cambridge, determinations are being made of the rates at which water evaporates from apples, eggs and cheese, and of the effect of the temperature, the humidity and the movement of the air upon them. At the Ditton Laboratory, near Maidstone, a model ship's hold was filled last autumn with 120 tons of apples, and the effects of this large mass of stored living material studied. An installation of 200 distant-reading electrical thermometers enabled the temperature throughout the stack to be mapped three times a day, while the heat removed by the cold brine was measured, and the humidity and the concentration of oxygen and carbon dioxide at various points among the fruit were determined by means of flexible sampling tubes.

Cold Storage Conditions for Meat

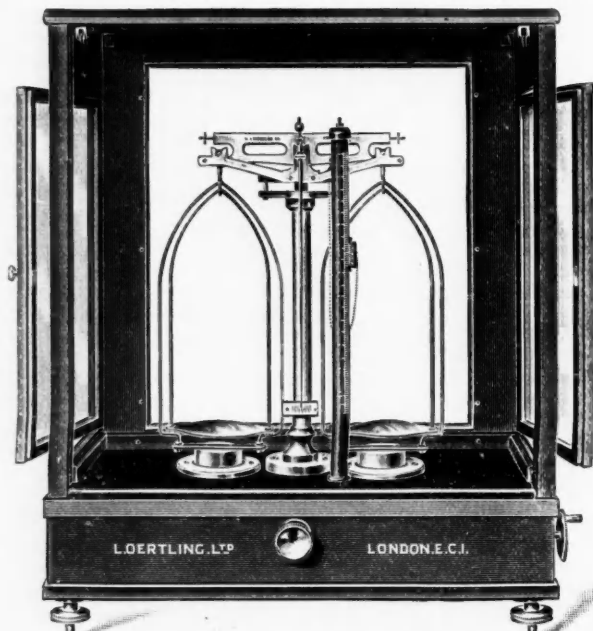
Detailed laboratory investigations into the control of the cold storage conditions necessary to preserve the "bloom," or freshly-killed appearance, in frozen meats have been carried on for a period of two years, and a considerable amount of data respecting temperature, humidity and movement of the air have been secured, these being the three factors which determine "bloom" and also the quality or palatability. Continuous observations have also been made on the loss in weight of the carcasses, which, although only 1 per cent., involves a loss to the imported meat trade amounting to £100,000 during the average season. In the investigation of unpleasant odours and tastes which develop in the fat of meat which has been kept in cold storage, it has been found that

exposure to light is a condition which favours deterioration, and that very short exposure to light starts chemical changes which continue even after the fat has been removed to a dark room.

Improvements in Balances

Features of New British Models

A RANGE of new and interesting British precision balances is on view at the showrooms of L. Oertling, Ltd., 65, Holborn Viaduct, London, E.C.1. These include balances embodying the now well-known chainomatic attachment of this firm, enabling precise weighings to be made without the use of weights below 0.1 grams, which permits a great saving in time. Of special interest is an aperiodic chainomatic balance, fitted with an air-damping device, a combination giving extreme



THE OERTLING APERIODIC CHAINOMATIC BALANCE

speed with analytical precision. Balances for special industrial purposes include the Oertling cigarette balance, a new design for rapidly weighing sample cigarettes and similar small objects. This is fitted with an oil dash-pot and gives direct readings of the number to the ounce or other convenient unit, no loose weights being used. Oertling balances have a world-wide reputation for reliability based on the finest craftsmanship of London instrument makers, and it is therefore of particular interest to note that a really cheap analytical balance is now offered. The object has been to meet foreign competition, felt particularly in connection with balances for educational use. In the Oertling "University" balance everything possible has been done to cut down costs, while maintaining sensitivity and wearing capacity. This balance has a sensitivity of 0.1 milligram, is built to carry 100 grams in each pan, and sells at the low price of £18 10s. Literature descriptive of the above and other British instruments will gladly be sent to readers, who are also cordially invited to visit the firm's showrooms.

Swiss Exports of Acetic Acid

Swiss exports of acetic acid declined more than 50 per cent. to 1,324,248 kilos in 1930, compared with the peak year of 1929 when 2,775,756 kilos were shipped out. The entire Swiss output is manufactured by the Lonza Elektrochemische Werke A.G., the second largest producer of acetic acid in Europe. Consumption of the acid in Switzerland is negligible and imports are small. Ninety per cent. of the Swiss exports is shipped to the Straits Settlements, Holland and Belgium. Shipments to the last two countries, however, are for re-export to the Dutch East Indies and other rubber growing regions.

A Bookman's Column

ALTHOUGH the constituents of the various essential oils have been adequately dealt with in the English language, with the exception of one monograph on the non-benzenoid hydrocarbons there has been nothing available which deals with the chemistry of the terpenes. This deficiency, however, has now been met by the publication of the first volume of *The Terpenes*, by J. L. Simonsen (Cambridge University Press, pp. 420, price 25s. net), wherein a description is given of the more important properties of the simpler acyclic and monocyclic terpenes and their derivatives. The second volume of this work will deal with the dicyclic terpenes and sesquiterpenes.

THE achievements of Antoine Lavoisier, who is universally regarded as one of the outstanding figures in the history of chemistry, are ably dealt with in a new book by J. A. Cochrane, *Lavoisier* (Constable and Co., pp. 264, price 7s. 6d. net). This distinguished Frenchman is best known for his work concerning analysis and synthesis, the composition of water, the processes involved in respiration, the determination of the coefficients of expansion, and the theory of combustion, but his studies took him beyond the laboratory out into the arena of politics. To-day, his fate—which was one of the appalling tragedies of the French Revolution—is scarcely remembered, and the author of this present biography is to be complimented on the manner in which he has handled a rather complicated mixture of scientific, historical and political facts.

IN *An Introduction to Chemistry*, by John Arrend Timm (McGraw-Hill Publishing Co., Ltd., pp. 561, price 17s. 6d. net), the philosophy of science has been emphasised and the order of presentation of its subject matter has been based on a logical development of the fundamental theories of chemistry. The scope of this book is exceptionally wide, the final chapters being devoted to electrochemical cells, colloids, carbohydrates, fats and proteins, and coal tar. *Elementary Inorganic Chemistry*, by J. W. Mellor (Longmans, Green and Co., pp. 229, price 3s. 6d. net) is another book which has been written along original lines, but is, of course, of much more elementary nature.

A SUMMARISED account of physical chemistry for candidates who are reading chemistry up to the final stage of their university course is given in *Modern Physical Chemistry*, by Frederick Hurn Constable (Ernest Benn, Ltd., pp. 157, price 10s. 6d. net). This book has been re-written from notes that have accumulated as the result of supervision classes at Cambridge. The whole ground is covered, and care has been taken to include all fully established recent developments, without minimising the importance of the older foundations on which the science rests.

A BRIEF critical summary of the analytical methods in use up to about eight or ten years ago, with references to original literature and English abstracts, and concise working details of methods which have been more recently introduced, forms the general scheme adopted in *Recent Advances in Analytical Chemistry*, edited by C. Ainsworth Mitchell (J. and A. Churchill, 2 vols., price 12s. 6d. each). This work has been published in two volumes, the first dealing with organic chemistry and the second covering inorganic chemistry. Both volumes are divided into sectional chapters which have been written by contributors with special knowledge of their subjects, and they are primarily intended for those who have a general knowledge of chemistry but require information as to the best methods of dealing with analytical problems in the various fields discussed.

VOLUME X of *Organic Syntheses* (Chapman and Hall, Ltd., pp. 119, price 8s. 6d. net) forms the first annual number in the second decade of this series of publications. No departure has been made from the general plan adopted in the preceding volumes, beyond the inclusion of a rather greater proportion of organic preparations of a bio-chemical rather than a strictly synthetic character. It is understood that a revised collection of the material presented in the first nine volumes is in preparation.

PUBLICATION of the seventh English edition of *A Text-Book of Organic Chemistry*, by A. F. Holleman (Chapman and Hall, Ltd., pp. 594, price 17s. 6d. net), brings the total number of editions now published in nine languages to 52, which is sufficient testimony to the value of this work as a text-book. In this new edition, one of the chief features is the space allotted to physico-chemical methods, as the importance of such properties as refraction, absorption and viscosity in organic chemical research is steadily increasing. The chapter on carbohydrates has been modified by the inclusion of an account of recent important researches on the constitution of the dioses, and by the reuniting of the section on enzymes. In connection with dyestuffs a review of the relationship between constitution and colour is also included.

THE atomic linking theory, with its emphasis on the relation existing between the properties of compounds and the nature and number of linkages in the molecule of such compounds, has been used as a basis for *Fundamentals of Organic Chemistry*, by Harry F. Lewis. (McGraw Hill Publishing Co., Ltd., pp. 390, price 13s. 9d. net). This book has been written in three parts: (i) petroleum hydrocarbons and their mono substitution products, (ii) poly-substitution products, (iii) ring compounds. Technical importance or scientific interest has been responsible for the choice of the individual compounds described; in consequence, the newer fermentation processes for the various alcohols, acetone, glycerol, and organic acids, the newer cracking processes for the efficient utilisation of crude petroleum, the catalytic oxidation of naphthalene to phthalic anhydride, and technical applications of the Friedel-Crafts reaction to the manufacture of anthraquinone and its derivatives, have been given special consideration.

A USEFUL BOOK for agricultural chemists and for the various workers engaged in the study of plant products from the medicinal, pharmacological, or purely scientific aspects, has now become available in *The Chemical Investigation of Plants*, by Dr. L. Rosenthaler (G. Bell and Sons, Ltd., pp. 197, price 12s. 6d. net.). This book is an authorised translation of the third, enlarged German edition by Sudhamoy Ghosh, who is professor of chemistry at the School of Tropical Medicine and Hygiene, Calcutta. The first part of the book deals with the fundamental principles involved in the systematic chemical investigation of a plant; the second part deals with general methods followed for the isolation and purification of the various classes of compounds met with in the vegetable kingdom.

A *Monograph of Viscometry*, by Guy Barr (Oxford University Press, pp. 318, price 30s. net), supplies the need of a book devoted entirely to viscometry in which an investigator should be able to find some account of most of the schemes which have been applied and some indication of the theoretical and practical difficulties that affect each of them. In sequence, the chapters cover the viscous flow of fluids in tubes, tube viscometers for absolute measurements, commercial viscometers, capillary viscometers for relative measurements, flow between parallel plates, the transpiration of gases, the falling sphere method, rotational and oscillational viscometers, and a study of anomalous systems. Official specifications and methods of manipulating the recognised industrial viscometers are dealt with in appendices.

IN preparing *Exercises in General Chemistry and Qualitative Analysis*, by Horace G. Deming and Saul B. Aronson (John Wiley and Sons, pp. 298, price 9s. net), which is now in its third edition, the authors have made the main purpose of each experiment quite plain by a "general statement." Their task has not been the mere imparting of chemical information, but rather an attempt to disclose the chemical point of view, for they point out that the dawning of chemical intelligence is noted when a student can foresee what sort of reaction is likely to take place when two substances are brought together, what experimental conditions are likely to be demanded, and how the products of the reaction may be separated and identified. Many exercises of a purely descriptive character are included, but these experiments are organised in such a way as to make them something more than an unordered sequence of trivial observations.

A Dyestuffs Agency Agreement

Terms of Settlement

IN the King's Bench Division on Tuesday, Mr. Justice McCardie had before him an action by Brown and Forth, Ltd., of Nettlefold House, Euston Road, London, against Major and Co., Ltd., of Norfolk Street, Strand, claiming damages for breach of alleged contract under which the plaintiffs had agreed to act as sole distributors or selling agents for all dyes and intermediates, made or dealt in by the defendants.

The question that arose was what was reasonable notice in a trade of this special character, where the opportunity of similar employment is necessarily limited.

The plaintiffs said their average commission for three years before the defendants in April, 1930, terminated the contract without notice, was £1,700 a year.

The defendants agreed to these figures, but said there were deductions of costs for earning the profit.

The plaintiffs contended that the usual notice was three years, while the defendants urged that six months' notice was adequate.

The plaintiffs said they had doubled the sales and brought them up to £22,120 in 1928.

■ The defendants formed their dyestuffs department into Emco Dyestuffs and the defendants' agents terminated the agreement, desiring to deal with the products themselves. In March, 1930, the defendants sold their business to the British Dyestuffs Corporation and the purchasers required that the whole of the contractual relations should cease. The defendants admitted a breach and paid a sum of money into Court.

His Lordship said he did not think that the plaintiffs were serious in suggesting a three years' notice. To his mind this seemed not to be an agency but a mixture of agency and purchase. They were not at law agents as far as he could see at present and he doubted whether the plaintiffs were entitled to any notice at all.

Ultimately the parties arrived at a settlement. It was agreed that the plaintiffs were to have £700 of the money paid into Court and that the defendants were to take the balance of £220.

Einstein's Electro Chemical Process, Ltd.

PRESIDING at the annual meeting of Einstein's Electro Chemical Process, Ltd., held in London on Friday, June 12, Major Guy M. Kindersley said that in the opinion of the board the company's existence would still be justified as a commercial proposition. Whilst regretting the very unsatisfactory results disclosed, the directors felt that they would not be justified in advising the shareholders to put the company into liquidation, and this view was endorsed by the preference shareholders' committee. Re-organisation of the management had been drastic and large economies had been effected.

Mr. J. H. Guy, chairman of the shareholders' committee, said that they most certainly recommended that the business should be carried on. If it were wound up at once practically the whole of the money in process of being collected would be wiped out in discharging present liabilities, while the additional cost of carrying on the business until the end of the year was not more than £3,000.

Surface Treatment of Aluminium

THE British Aluminium Co., Ltd., of Adelaide House, London, E.C.4, has issued a special memorandum relating to the surface treatment of aluminium and its alloys such as are required for protection from chemical, physical and mechanical agencies, electrical insulation, heat absorption and other purposes. The methods given are grouped in two main categories—mechanical and chemical. Mechanical methods include pressure plating, polishing, spray-coating, painting and enamelling, and ornamental finishing. Chemical methods are sub-divided under three main headings, (1) purely chemical, such as matting, immersion processes for colouring, metal plating, and oxidising; (2) physico-chemical, such as diffusion processes, cementation and oxidation by heating; and (3) electro-chemical processes, including anodic oxidation, electro-deposition of metals, coloured films, and production of black plates for heat absorption.

Chemical Matters in Parliament

Potash Fertilisers

ON Monday, June 8, Mr. Lambert (South Molton) asked the President of the Board of Trade whether he is aware that there exists a monopoly in the supply of potash fertilisers which has prevented a reduction in price as compared with other fertilisers; and if he can take any steps to modify such monopoly and to ensure the supply of potash to agriculturists at a reasonable price.

The Parliamentary Secretary to the Board of Trade (Mr. W. R. Smith): An agreement was reached some years ago between the French and German interests which control the great bulk of the supplies, and prices in this country have risen somewhat since that time. I regret that there does not appear to be any action that I can usefully take in the matter at present.

Mr. Lambert: Do the Board of Trade intend to take any action in the near future on this rather important question?

Mr. Smith: It is a difficult subject to deal with when these arrangements are made by those who control such matters.

Lieut.-Colonel Heneage (Louth): Have the Board of Trade considered the development of Empire resources which are known to exist?

Indian Oil Industry

IN the House of Commons on Monday, June 15, Mr. Remer (Macclesfield) asked the Secretary of State for India if in view of the injury caused to the producers of oil in Burma by the importation of cheap American and Russian oils into India and Burma, and the consequent reduction in the purchasing power of the Indian and Burmese people and the injury to British exporters to India, he will state what the Indian Government is doing to protect the interests of oil producers in Burma?

Mr. Benn: The question of safeguarding the oil industry in India against injury from the importation of cheap foreign oils was considered by the Indian Tariff Board and the Government of India in 1928 and it was decided that no action was called for. So far as I know the oil producers have not since asked the Government of India to take any action on their behalf.

Beet Sugar Subsidy

A FINANCIAL memorandum dealing with the offer made by the Prime Minister in the House of Commons last February of a special advance to the beet sugar industry for the season 1931-32 was issued on Thursday, June 11, by the Minister of Agriculture and Fisheries. The offer was to pay on a sliding scale, in accordance with the market price of imported raw sugar, of a sum not exceeding 1s. 3d. per cwt. of sugar manufactured, in addition to the subsidy of 6s. 6d. payable under the Act of 1925. The owners of twelve out of the eighteen factories had accepted the terms, and the direct cost of the special advance is estimated at a maximum figure of £225,000. These factories have made contracts with beet growers for 1931-32 on the basis of 37s. 6d. per ton of 15½ per cent. sugar content. The total acreage of beet contracted for was returned on May 31 as 151,478 acres.

Drug and Fine Chemical Trade Wages

IT is understood that the Executive of the National Union of Drug and Chemical Workers will probably decide to take another ballot on the revised proposals of the fine chemical manufacturers affecting wages.

The manufacturers' association now proposes to extend until July 2 the agreement which was due to expire on Saturday, June 20, whilst proposals affecting operatives between the ages of 21 and 24 have been withdrawn. In the opinion of the union, this has considerably eased the situation, but there is still a dispute, as the union considers there is no necessity for any cut in wages, and the employers have not conceded any of the demands in the operatives' programme. The union has asked, among other things, for an advance of 7s. a week on existing rates and a reduction of hours from 48 to 44 per week. The extension to July 2 is for the purpose of allowing the Union to again consult its members, but if the union fails to secure its members' acceptance of the new offer, the original terms will be proceeded with by firms posting notices on July 2.

From Week to Week

AN OUTBREAK OF FIRE occurred at the Dundas Chemical Works, Mossbank, Dumfries, last week, when a large quantity of feeding stuffs was entirely destroyed.

OWING to the death of Lord Trent, the annual general meeting of Boot's Pure Drug Co., Ltd., over which his son, the Hon. J. C. Boot, was to have presided on Wednesday last, June 17, has been postponed until Thursday, June 25.

POSSIBILITIES FOR A POTASH INDUSTRY in Spain are being opened up by the working of rich deposits in Navarre, discovered in 1928. Spanish, British and American interests are concerned in securing concessions to work the deposits which extend from Pamplona to the Aragon River in a zone about 35 miles wide.

UNITED STATES imports of resorcinol entered for consumption during the first four months of 1931 amounted to 11,200 lb., a decline of 43 per cent. compared with the quantity (19,800 lb.) entered during the corresponding period of 1930. The entire 1931 shipments originated in France, which also supplied the major portion of the 72,418 lb. and 47,760 lb. of resorcinol imported during 1930 and 1929 respectively.

AN ARRANGEMENT has been concluded between Courtaulds, Ltd., the Bradford Dyers' Association, and a group of Lancashire textile manufacturers, which will enable rayon fabrics to be produced and shipped to the Far East to compete with Japanese cloths. Courtaulds will supply the yarn, which will be made into standard cloths. The Bradford Dyers' Association will then dye them and export them to India and China.

A SERIES OF EIGHT LECTURES and demonstrations on tropical hygiene, intended for persons outside the medical profession proceeding to the Tropics, will be given by Lieut.-Colonel G. E. F. Stammers, M.R.C.S., L.R.C.P., D.P.H., at the London School of Hygiene and Tropical Medicine, July 6-10. A synopsis can be obtained from the Secretary, London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1.

AN EXPERIMENTAL TESTING PLANT with a daily capacity of 200 tons, designed to recover gold losses in the "tailings" is being installed at the Lake Shore mine in the Kirkland Lake district, Canada, by the American Cyanamid Co., Ltd. The process to be employed has been developed on a laboratory scale. As over 1,500,000 tons of ore are milled annually in the Kirkland Lake area it is ultimately anticipated that gold to the annual value of one million dollars will be recovered.

A NEW METHOD for the recovery of cyanide from leaching solutions or waste mill liquors produced in normal practice by cyanidation of gold and silver ores has been devised by Mr. H. T. Durant and Sulman and Picard, in association with the General Engineering Co., and is likely to prove of interest to those engaged in cyaniding operations. It not only provides for the recovery of the residual cyanide carried by weak liquors or foul solutions, but also introduces improvements in the precipitation of the metal values.

THE ARTIFICIAL SILK MILLS, plant and machinery of the British Acetate Silk Corporation, Ltd., at Stowmarket, will be sold by action on Tuesday, July 14. The processing mills and plant at Halifax, belonging to the same company, will be disposed of in a similar manner on June 23. A very wide range of plant and equipment is to be included in these sales, as well as an extensive stock of acetate and other chemicals. The auctioneers are Hillier, Parker, May and Rowden, of 27, Maddox Street, London, W.1, and 44, Brazennose Street, Manchester.

THE most important industrial chemical plant in Sweden is the Reymersholms Gamla Industri-Aktiebolag, at Helsingborg. In 1930 this company produced 53,561 metric tons of 100 per cent. sulphuric acid, 5,428 tons of hydrochloric acid, 7,270 tons of sodium sulphate and 20,837 tons of aluminium salts. These products were manufactured at Helsingborg, Limhamn, and Liljeholmen. The Reymersholms company is an important domestic manufacturer of superphosphates and its 1930 output of 89,800 metric tons was more than one-third of the total Swedish production of 258,600 tons.

EDITORIAL SERVICES, LTD., announce that on June 22 they are moving to more extensive offices at The Field House (off Chancery Lane), London, E.C.4.

IMPORTS OF WOOD PRESERVATIVES into the Federated Malay States during the fourth quarter of 1930 totalled 4,836 gallons as compared with 22,589 gallons in the corresponding period of 1929.

A THIRD DEATH, that of Arthur Rowley, has resulted from the explosion and fire which occurred at the works of the Staffordshire Chemical Co., Chatterley, Stoke-on-Trent, on June 3. (THE CHEMICAL AGE, June 6, page 516).

TWO THOUSAND MINERS and workers from Bathgate, Armadale, Uphall, and Whitburn completed their final shift last night in the Scottish shale oil field, owing to decreased output consequent upon the fall in the price of petrol.

THE CANADIAN GYPSUM CO., LTD., a subsidiary of the United States Gypsum Co. has purchased property near Willow Grove, south of Hamilton, Ontario (Canada), where a new vein of massive gypsum has been located. They are shortly erecting plant for the manufacture of a complete range of gypsum products.

THE UNITED STATES BUREAU OF MINES has issued a revised edition of *Bulletin No. 279*, "Limits of Inflammability of Gases and Vapours," by H. F. Coward and G. W. Jones. The data in this bulletin is of importance to all industries where inflammable gases or vapours are produced or utilised. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, U.S.A.

ACCORDING to the 1931 report on the research scheme of the Institute of Brewers, a large amount of work was carried out during the preceding year on the effect of copper boiling on the antiseptic substances of hops with particular reference to the flavour and stability of the beer produced. This work has been in the hands of Dr. T. K. Walker, M.Sc., F.I.C., and Mr. J. J. H. Hastings, M.Sc.Tech., at the College of Technology, Manchester.

THE DEPARTMENT OF OVERSEAS TRADE announces that Sir Francis l'Estrange Joseph, C.B.E., J.P., who was a member of the United Kingdom Trade Mission to South Africa, has accepted membership of the Overseas Trade Development Council. Sir Francis Joseph is chairman and managing director of Settle Speakman and Co., Ltd., Mossfield Colliery, Ltd., and Bignall Hill Colliery Co., Ltd., and has been president of the North Staffordshire Chamber of Commerce since 1923.

ACCORDING to the United States Assistant Trade Commissioner in Paris, the maximum daily production of nitric acid in France is 400 metric tons. When the Toulouse nitric acid plant begins operation, production will be increased by 200 metric tons. The service des Poudres is considering the possibility of installing two new factories, one at Rouen and the other in the centre of France, with a production of 225 metric tons, making a total daily production capacity of 825 metric tons.

ACCORDING to the *Frankfurter Zeitung*, agreement has been reached by I.G. Farbenindustrie, the German Dyes Trust, and the Montecatini Co. in Italy, with a view to common action in the Italian dyes industry. A new company is to be formed, with the title of "New Acna," having a capital of 60,000,000 lire. Of this sum the Montecatini concern will subscribe 31,000,000 lire and I.G. Farbenindustrie 29,000,000 lire. As a result of this agreement rivalry between the German Dyes Trust and the Italian Colour Factories will terminate.

Obituary

JOSEPH LEWIS, D.Sc., chief government analyst, South Africa, died at Johannesburg on May 4, aged 57.

LORD TRENT, formerly Sir Jesse Boot, founder of Boot's Cash Chemists, died on Saturday, June 13, at his residence in Jersey, aged 81 years. He was knighted in 1909, received his baronetcy in 1916, and was raised to the peerage in 1929. He was a great benefactor to Nottingham, and in 1928 he presented to the city its new University buildings and site at a cost of nearly £1,000,000. The heir to the peerage is Lord Trent's son, the Hon. John Campbell Boot, who is chairman of Boot's Pure Drug Co., Ltd.

Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Abstracts of Accepted Specifications

- 344,796. ALCOHOLS AND FORMALDEHYDE. J. R. Park, Norton Hall, The Green, Norton-on-Tees, and Imperial Chemical Industries, Ltd., Millbank, London. Application date, December 10, 1929.

Alcohol obtained by catalytic hydrogenation of oxides of carbon is freed from iron compounds by prolonged treatment with alkali, at ordinary or raised temperature, with simultaneous aeration of the liquid. Methanol may be passed over solid caustic soda and then into a steel tank, air being passed through while the tank is filling. After standing, the liquid is distilled. The purified methanol may be used for the production of formaldehyde by passing with air over red-hot silver gauze, without deterioration of the catalyst.

- 344,801. SULPHATE AND HYDROCHLORIC ACID FURNACES. H. Frischer, 91, Kerpenerstrasse, Lindenthal, Cologne, Germany. Application date, December 10, 1929.

Chlorides are treated with sulphuric acid to produce hydrochloric acid and sulphates, in furnaces in which the bottom, walls, pipes, stirrers, and scrapers are constructed wholly or partly of silicon carbide, which may be mixed with chamotte, moulded into bricks, and heated.

- 344,826. NITRIC ACID, CHEMICAL APPARATUS. N. Caro, 97, Hohenzollerndamm, Dahlem, Berlin, and A. R. Frank, 138, Kurfürstendamm, Halensee, Berlin. Application date, December 6, 1929.

Highly concentrated acid is produced from nitrogen oxides or liquid nitrogen tetroxide, water and oxygen at high temperature and pressure in an apparatus constructed of, or lined with aluminium or aluminium-silicon alloy which may be coated with a film of aluminium oxide. The water content is preferably kept low by using aqueous tetroxide containing acid instead of water and nitrogen tetroxide. Any aluminium introduced into the liquor separates as a sludge on concentration and protects the walls.

- 344,841. SULPHUR AND SULPHURIC ACID. S. L. De la Torre, 8, Calle San Mateo, Madrid. International Convention date, August 27, 1929.

An alcoholic solution of salicylic or tartaric acid is mixed with a solution of sodium thiosulphate to obtain nascent sulphur having a molecular weight S_2 or S_6 , which is spontaneously oxidised in air at 60°C ., yielding sulphuric acid.

- 344,899. DE-TINNING SCRAP TIN PLATE. W. H. Wade, 112, Hatton Garden, London; J. W. Hinchley, 55, Redcliffe Road, West Brompton, London; and J. D. Parsons, 138, Rainham Road, Chatham, Kent. Application date, December 13, 1929. Addition to 327,997. (See THE CHEMICAL AGE, Vol. XXII, p. 582.)

A solution of lead hydrate in caustic alkali obtained by adding lead acetate to caustic alkali solution, is employed as the de-tinning agent. The scrap is treated with the liquid while air is bubbled through, and calcium stannate is then precipitated from the solution by adding milk of lime. Caustic alkali is obtained and is used again in the process, and the spongy lead is treated with acetic acid to regenerate lead acetate. The alkali acetate obtained in the first step is treated with sulphuric acid to recover acetic acid so that the process is cyclic.

- 344,959. ALKALI ALUMINATES AND SULPHUR. Sulphates Proprietary, Ltd., 395, Collins Street, Melbourne, Australia. International Convention date, December 22, 1928.

A mixture of bauxite, alunite, etc., with an alkali acid sulphate or an alkali sulphate and free sulphuric acid is briquetted and treated in a shaft furnace in counter current to a reducing gas such as water gas. Heating gases may be passed through an annular flue. The product is then subjected to oxidation in thin layers by a current of air to decompose any sulphides and the product crushed and lixiviated to obtain alkali aluminates. Sulphur may be obtained from the waste reducing gases.

- 344,962. AMMONIUM PHOSPHATE AND SODIUM BICARBONATE. Soc. d'Etudes Scientifiques et d'Entreprises Industrielles, Ougrée, Belgium. International Convention date, December 27, 1928.

Phosphates are reduced at high temperature, and the liberated gases are oxidised, yielding phosphorus oxides and carbon dioxide. The gaseous mixture is used in place of carbon dioxide in the manufacture of sodium bicarbonate and ammonium chloride from sodium chloride, the amount of ammonia employed being increased in order to form ammonium phosphate with the phosphorus oxides. The precipitated sodium bicarbonate is removed and the liquor crystallised to obtain a fertiliser containing ammonium chloride and phosphate. Details are given of alternative methods of carrying out the process.

- 344,970. ALKYL PHENOLS. Schering Kahlbaum Akt.-Ges., 170, Müllerstrasse, Berlin. International Convention date, December 31, 1928. Addition to 273,685 and 279,885.

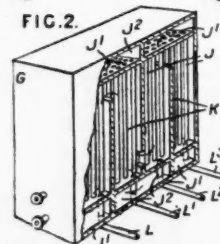
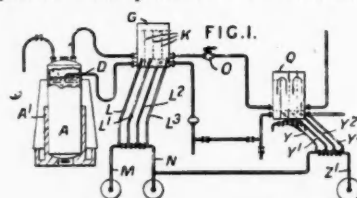
The condensation products of *m*- or *p*-cresol and aliphatic ketones are heated to 300°C . in a stream of hydrogen and the decomposition products with hydrogen are passed over a hydrogenating catalyst at 200°C . to hydrogenate the alkylene phenols. The catalyst may be nickel on pumice. Examples are given of the preparation of thymol from the condensation product of *m*-cresol and acetone, and of 4-methyl-6-isopropylphenol from the condensation product of *p*-cresol and acetone.

- 344,971. METHYLAMINE. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. Application date, December 24, 1929.

A carbimide or an imide of a carboxysulphonic acid or a methylol compound is heated under pressure with formaldehyde or a polymer such as polyoxy- or trioxy- methylene in the presence of an organic inert water-soluble solvent. The product may be saponified by heating under pressure with aqueous sulphuric acid or caustic soda to obtain methylamine. Diacetamide, the imides of dibasic acids such as phthalimide, the imide of *o*-sulphobenzoic acid or cyanuric acid may be used, and the solvent may be methanol, ethanol, ethylene-glycol, propandiol, glycerol or dioxane. Several examples are given.

- 345,005. CRACKING OILS. A. E. White, London. From Bethlehem Steel Co., Bethlehem, Pa., U.S.A. Application date, January 18, 1930.

Oil is vaporised under pressure in a still A and the vapour



345,005

partly condensed in a heat exchanger G also under pressure, the condensate passing through pipes L^1 — L^3 to receivers M, N. Crude oil is passed through the heat exchanger G to the still A. The vapour then passes to a heat exchanger Q under atmospheric pressure, and lighter fractions are condensed

and led to a receiver Z^1 . Crude oil enters the system through the heat exchanger Q . The heat exchangers are divided by vertical baffles K , and the crude oil flows through pipes J connecting headers J^1 , J^2 .

344,975. **DESTRUCTIVE HYDROGENATION.** Imperial Chemical Industries, Ltd., Millbank, London; R. Holroyd, Norton Hall, The Green, Norton-on-Tees; and C. Cockram, Winnington Hall, Northwich, Cheshire. Application date, December 28, 1929.

Bituminous coal is hydrogenated in liquid phase using a catalyst consisting of metal balls, ribbon, wire, gauze or grids, a metal of the copper sub-group 1 or a metal of group 2 is used, together with a metal of groups 3—7, *e.g.*, tin or tinned iron with copper or silver sheet.

345,130. **DYES.** I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. International Convention date, April 22, 1929.

6-Methyl-3-hydroxy-thionaphthene is condensed with an α -derivative of a 5-chlor- or 5-bromisatin. The α -chlorides may be used, and are obtained by treating the isatin in chlorobenzene solution with phosphorus pentachloride. 6-Methyl-3-hydroxy-thionaphthene is obtained by subjecting dehydrothiolutidine to alkali fusion and condensing the 1-methyl-4-amino-5-mercaptobenzene with monochloro-acetic acid, and converting the resulting 1-methyl-4-aminobenzene-5-thioglycolic acid into the hydroxythionaphthene.

345,186. **REFINING HEAVY SPAR.** Metallges. Akt.-Ges., 45, Bockenheimer Anlage, Frankfurt-on-Main, Germany. International Convention date, August 28, 1929.

Heavy spar is freed from quartz, shale, etc., and calcined at 800° — $1,200^{\circ}$ C. to burn out bitumen, and is then treated with hot hydrochloric acid with or without cooling indirectly by water. The residue is washed and then treated with ammonia.

345,190. **CHLORIDE DIOXIDE.** W. Becher, 6, Rostocklaan, Bussam, Holland. International Convention date, August 26, 1929.

The mixture of a chlorate with an inert substance such as gypsum or pumice is treated with sulphuric acid. Inert gas may be present during the reaction, charged with gaseous organic reducing agents such as formic acid or formaldehyde, or the inert gas may be formed *in situ* by adding salts which react with sulphuric acid. Oxide of vanadium, iron or osmium may be present as a catalyst. In an example, potassium chlorate and gypsum are made into a paste with water, and the resulting hard product is treated with sulphuric acid.

345,197. **POLYMERISED STYRENE AND ITS HOMOLOGUES.** A. Carpmal, London. From I. G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. Application date, November 7, 1929.

Liquid styrene or a homologue, or an incompletely polymerised styrene, is mixed with a powdered material, further polymerised to the required extent, and moulded.

345,204. **DYES AND INTERMEDIATES.** R. Tonkin, J. Thomas and Scottish Dyes, Ltd., Earl's Road, Grangemouth. Application date, December 4, 1929.

Phthalic anhydride is condensed with *o*-chlorphenol in presence of an acid condensing agent, and the product nitrated in the group containing the Cl and OH-substituents by treating with nitric acid sufficient to introduce one nitro group. The product is reduced by means of iron and acid, or a ferrous salt.

345,234. **CARBON MONOXIDE.** B. M. S. Kalling, Alvbro, and C. Von Delwig, 2, Stationsgatan, both in Avesta, Sweden. International Convention date, December 10, 1928.

A mixture of charcoal and coke is fed into a horizontal or inclined rotary furnace and is heated by passage of an electric current, which may be supplied through electrodes in the form of radial arms. The carbon is lifted and allowed to fall by the revolving electrodes and projections on the internal wall of the furnace may also be provided for this purpose. Carbon dioxide is passed through the furnace and is converted into monoxide by contact with the heated carbon.

345,253. **UNSATURATED ETHERS.** J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. Application date, December 12, 1929.

The vapour of an aliphatic or aromatic acetal, with or

without a diluent, is passed over silver, gold, platinum, palladium or other precious metal, with or without a metal of groups 1—4 or 6—8 or their oxides, phosphates or silicates. A number of these metals are specified, and the usual catalyst carriers may be employed. The diluent may be nitrogen, carbon dioxide, methane, or the vapour of water, alcohol, ether or benzene. Examples are given of the treatment of diethyl acetal, acetone diethyl acetal, propionaldehyde diethyl acetal, butyl aldehyde dimethyl acetal, acetophenone diethyl acetal, etc. The products are vinyl and other unsaturated ethers.

345,270. **BUTADIENE.** I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. International Convention date, December 18, 1928.

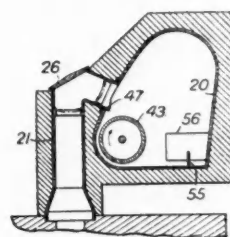
The vapour of an unsaturated alcohol having four or more carbon atoms, *e.g.*, allyl carbinol, with or without water vapour, is passed over a dehydrating catalyst, such as alums or acid phosphates, with or without free phosphoric acid. In an example, allyl-carbinol vapour is treated to obtain butadiene.

345,271. **KETONES.** H. Dreyfus, 22, Hanover Square, London. Application date, December 18, 1929.

Aliphatic alcohols with at least two carbon atoms are treated at high temperatures with barium hydroxide to obtain the barium salt of the corresponding fatty acid. The barium salt is then decomposed by heat to obtain the ketone. The alcohol may be treated with barium hydroxide at 250° to 350° C., and the temperature then raised to 400° to 500° C. to obtain the ketone, or the operation may be made continuous by working at 300° to 500° C. Acetone may be obtained from ethyl alcohol and diethylketone from propyl alcohol.

345,272. **DISTILLING HYDROCARBONS.** Barrett Co., 40, Rector Street, New York. Assignees of C. G. Stupp, 40, Rector Street, New York. International Convention date, December 18, 1928.

Tars and oils are distilled in a still having a curved top 20, and a rapidly rotating cylinder 43 which maintains the walls



345,272

of the still covered with the liquid, and the still filled with a liquid spray. Heating is effected by hot coal-distillation gas introduced through pipe 21. The hot gas then passes through separating chambers to condensers.

345,277. **DYE INTERMEDIATES.** R. J. Loveluck, J. Thomas and Scottish Dyes, Ltd., Earl's Road, Grangemouth. Application date, September 13, 1929.

o-Dichlorobenzene is condensed with phthalic anhydride in the presence of aluminium chloride, and the 3':4'-dichlor-2-benzoyl-benzoic acid is nitrated, and then reduced with ammonia and ferrous sulphate or other reducing agents.

345,334. **ORGANO-METALLIC COMPOUNDS.** J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. Application date, December 18, 1929.

Ethylene with or without an inert gas such as nitrogen or hydrogen is passed at 40° to 60° C. into a suspension of aluminium chloride in ligroin, petroleum ether, paraffin oil or other solvent. A double compound of aluminium chloride and ethylene is obtained and is used for condensing hydrocarbons.

345,349. **DYES AND INTERMEDIATES.** I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. International Convention date, December 22, 1928.

6-Amino-indazoles in which at least one of the hydrogen atoms ortho to the amino group is unsubstituted, and in which the benzene hydrogens and the hydrogen atom attached to the

pyrazol nitrogen may be substituted by alkyl groups, are treated with a sulphocyanide and a halogen, the sulphocyanic group thus introduced is split up with formation of a mercapto group, and the product condensed with chloroacetic acid and the resulting thio glycolic acid converted into the hydroxy-pyrazole-thionaphthene. The latter is oxidised or condensed with isatins, thioisatins, or the α -chlorides or arylides thereof to obtain thioindigo dyes. Several examples are given.

- 345,282. DESTRUCTIVE HYDROGENATION. H. D. Elkington, London. From Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij, 30, Carel van Bylandtlaan, The Hague. Application date, October 15, 1929.

Liquid carbonaceous materials containing high boiling or semi-solid constituents are distilled under pressure, with or without hydrogen. The solid residue is removed and the condensate is treated with hydrogen under pressure in the presence of colloidal molybdenum oxide.

- 345,305. DESTRUCTIVE HYDROGENATION. H. W. Strong, Norton Hall, The Green, Norton-on-Tees, Durham, and Imperial Chemical Industries, Ltd., Millbank, London. Application date, December 20, 1929.

Destructive hydrogenation catalysts consist of cobalt or nickel alloyed and/or coated with tin, and in the powdered or massive state. The alloy contains more than 5 per cent. of cobalt, so that it does not melt under the working conditions. In an example, middle oil from liquid phase destructive hydrogenation is vapourised and hydrogenated in the presence of a nickel alloy coated with tin, at 470° C. and 250 atmospheres, and a yield of 37.5 per cent. of petrol boiling below 200° C. is obtained in one operation.

Specifications Accepted with Date of Application

- 349,432. Electro-deposition of zinc, Methods of. U. C. Tainton. November 26, 1929.
- 349,444. Dehydrogenation, polymerisation, and condensation of hydrocarbons with the aid of a catalyst. Gas Light and Coke Co. and R. H. Griffith. January 25, 1930.
- 349,455. Barbituric acid derivatives. Compagnie de Bethune. January 16, 1930. Addition to 3,904 1930.
- 349,470. Valuable products from carbonaceous materials wholly or mainly consisting of hydrocarbons of aromatic nature, Manufacture of. H. D. Elkington (Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij). February 26, 1930.
- 349,471. Hydrogen, carbon monoxide/hydrogen mixtures or nitrogen hydrogen mixtures, Production of. M. D. Bone, and Imperial Chemical Industries, Ltd. February 26, 1930.
- 349,472. Eliminating arsenic from acids, particularly sulphuric acid. Metallges. Akt.-Ges. November 13, 1929.
- 349,477. Iron ore, Process of reducing. A. Musso and W. P. Deppe. November 21, 1929.
- 349,499. Artificial rubber or rubberlike masses, Manufacture of. A. Carpmal. (I.G. Farbenindustrie Akt.-Ges.) February 24, 1930.
- 349,527. Sulphonating higher fatty acids and their derivatives. Naamlooze Vennootschap Chemische Fabriek Servo and M. D. Rozenbroek. January 22, 1929.
- 349,556. Water soluble condensation products derived from formaldehyde with aliphatic aldehydes and/or ketones, Manufacture of. I. G. Farbenindustrie Akt.-Ges. March 2, 1929.
- 349,563. Extracting metals from ores, minerals, and other materials. National Processes, Ltd., and A. R. Gibson. November 29, 1929.
- 349,566. Fertilizers, Production of. A. M. Clark, W. K. Hall, and Imperial Chemical Industries, Ltd. January 29, 1930.
- 349,575. Phenols, Reduction of. F. Uhde. March 6, 1929. Addition to 339,317.
- 349,587. Alloys from pulverulent initial materials, Manufacture of. J. Y. Johnson. (I.G. Farbenindustrie Akt.-Ges.) December 23, 1929.
- 349,588. Valuable hydrocarbons rich in hydrogen from tars or like carbonaceous materials, Manufacture of. J. Y. Johnson. (I.G. Farbenindustrie Akt.-Ges.) January 23, 1930.
- 349,591. Froth flotation concentration of minerals, Manufacture of. Minerals Separation, Ltd., H. Lavers, and A. H. Higgins. January 31, 1930.
- 349,600. Black Azo dyestuffs, Manufacture of. A. Carpmal. (I.G. Farbenindustrie Akt.-Ges.) February 24, 1930.
- 349,607. Materials containing lead, Treatment of. C. R. Hayward. February 28, 1930.
- 349,609. Mordant dyestuffs, Manufacture of. Durant and Huguenin Akt.-Ges. March 1, 1929.
- 349,625. Producing molten and refined metals from their crude ores. Method of an apparatus for. A. E. White. (Doherty Research Co.) March 1, 1930.

- 349,635. 1-hydroxy and 1-alkoxy-anthraquinone-3-carboxylic acids and their substitution products, Manufacture of. A. Carpmal. (I.G. Farbenindustrie Akt.-Ges.) February 4, 1930.
- 349,677. Derivatives of meta-hydroxy-diphenylamine, Manufacture of. W. W. Groves. (I.G. Farbenindustrie Akt.-Ges.) March 12, 1930.
- 349,682. Tetrazoles, Production of. Knoll Akt.-Ges. Chemische Fabriken. March 14, 1929.
- 349,685. Organo mercury compounds, Manufacture of. Johnson and Johnson (Great Britain), Ltd. (Johnson and Johnson.) March 18, 1930.
- 349,692. Potassium and/or sodium ferro-cyanide, Method of obtaining—in the purification of coal gas. R. Brandt. March 24, 1930.
- 349,700. Bessemerizing of nickel containing mattes. H. Wade. (International Nickel Co., Inc.) March 28, 1930.
- 349,713-4. Vat dyestuffs of the Anthraquinone series, Manufacture of. I. G. Farbenindustrie Akt.-Ges. April 9, 1929.
- 349,715. Separating arsenic sulphide precipitates from acids. A. L. Mond. (Metallges. Akt.-Ges.) April 10, 1930.
- 349,761. Amino-alkoxy derivatives of aryl-quinolines, Manufacture of. Soc. of Chemical Industry in Basle. May 16, 1929.
- 349,771. Purification of hydrogen peroxide solutions. Kali-Chemie Akt.-Ges. June 15, 1929.
- 349,795. Ortho-amino-carboxylic acid esters of the anthraquinone series, Manufacture of. I. G. Farbenindustrie Akt.-Ges. June 14, 1929. Addition to 267,164 and 314,028.
- 349,796. Acylamino-benzene stibinic acids, Manufacture of. I. G. Farbenindustrie Akt.-Ges. June 15, 1929.
- 349,823. Sylvinitic crude salts, Process for working up—to a mixture of potassium nitrate and sodium nitrate, or this mixture and soda. Chemieverfahren-Ges. August 23, 1929.
- 349,830 and 349,840. Salt bath furnace for heat treatment of steel or the like. Siemens-Schuckertwerke Akt.-Ges. August 24 and 9, 1929.
- 349,842. Electrolytically depositing aluminium. Aluminium Industrie Akt.-Ges. August 24, 1929.
- 349,872. Asymmetrical dichlorethylene, Production of. A. L. Mond. (I.G. Farbenindustrie Akt.-Ges.) September 17, 1929.
- 349,877. Phosphate rock and the like, Treatment of. Odda Smeltewerke Aktieselskap and E. Johnson. September 28, 1929. Addition 26,914 1929.
- 349,892. Destructive hydrogenation of carbonaceous materials. J. Y. Johnson. (I.G. Farbenindustrie Akt.-Ges.) March 6, 1930.

Applications for Patents

[In the case of applications for patents under the International Convention, the priority date (that is, the original application date abroad which the applicant desires shall be accorded to the patent) is given in brackets, with the name of the country of origin. Specifications of such applications are open to inspection at the Patent Office on the anniversary of the date given in brackets, whether or not they have been accepted.]

- Carpmal, A., and I. G. Farbenindustrie Akt.-Ges. Manufacture of azo dyestuffs, etc. 17,018. June 11.
- Coley, H. E. Production of volatile metals. 16,651. June 8.
- Manufacture of tin. 16,777. June 9.
- Manufacture of zinc. 16,778. June 9.
- Concordia Bergbau Akt.-Ges., Nettlebusch, L. and Schneider, R. Treatment of crude benzol. 17,182. June 12.
- Daudt, H. W. Manufacture of di-substituted guanidines. 16,647. June 8.
- Dudley, U. A. R. Cracking hydrocarbons. 17,151. June 12.
- Du Pont de Nemours and Co., E. I. Manufacture of di-substituted guanidines. 16,647. June 8.
- Liquid hydrocarbon fuels. 16,832. June 9.
- I. G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of coating-compositions. 16,685. June 8.
- I. G. Farbenindustrie Akt.-Ges. Manufacture of derivatives of alkylolamines. 16,909. June 10. (Germany, June 10, 1930.)
- Manufacture of azo-dyestuffs. 16,917. June 10. (Germany, June 10, 1930.)
- Manufacture of 1-phenyl-2-amino-alcohols-1 containing hydroxyl in the phenyl nucleus. 17,129. June 12. (Germany, June 13, 1930.)
- Imperial Chemical Industries, Ltd. Carrying out endothermic gas reactions. 16,648. June 8.
- International Bitumenoil Corporation. Producing fuel from coking coal, etc. 17,040. June 11. (United States, March 5.)
- Jenaer Glaswerk Schott and Gen. Apparatus for concentrating solutions and acids. 17,072. June 12. (Germany, June 14, 1930.)
- Soc. of Chemical Industry in Basle. Manufacture of acetylene from hydrocarbons. 16,671. June 8. (Germany, June 6, 1930.)
- Strange, E. H. Manufacture of esters. 17,229. June 13.
- Tennant, W. J., and Silica Gel Corporation. Adsorption systems. 17,243. June 13.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£18 15s. per ton d/d address U.K. in casks.
 ACID CHROMIC.—11d. per lb., less 2½% d/d U.K.
 ACID HYDROCHLORIC.—Spot, 3s. 9d. to 6s. carboy d/d, according to purity, strength and locality.
 ACID NITRIC, 80° Tw.—Spot, £20 to £25 per ton makers' works, according to district and quality.
 ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.
 AMMONIA (ANHYDROUS).—Spot, 10d. per lb., d/d in cylinders.
 AMMONIUM BICHROMATE.—8½d. per lb. d/d U.K., or 8d. c.i.f. export
 BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.
 BLEACHING POWDER, 35/37%.—Spot, £7 19s. per ton d/d station in casks, special terms for contracts.
 BORAX, COMMERCIAL.—Crystals, £13 10s. per ton; granulated, £12 10s. per ton; powder, £14 per ton. (Packed in 1 cwt. bags, carriage paid any station in Great Britain. Prices quoted are for one ton lots and upwards.)
 CALCIUM CHLORIDE (SOLID), 70/75%.—Spot, £4 15s. to £5 5s. per ton d/d station in drums.
 CHROMIUM OXIDE.—9d. to 9½d. per lb. according to quantity d/d U.K.
 CHROMETAN.—Crystals, 3½d. per lb. Liquor, £18 12s. 6d. per ton d/d U.K.
 COPPER SULPHATE.—£25 to £25 10s. per ton.
 METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 11d. to 2s. 4d. per gall.; pyridinised industrial, 2s. 1d. to 2s. 6d. per gall.; mineralised, 3s. to 3s. 4d. per gall. 64 O.P., 1d. extra in all cases. Prices according to quantity.
 NICKEL SULPHATE.—£38 per ton d/d.
 NICKEL AMMONIA SULPHATE.—£38 per ton d/d.
 POTASH CAUSTIC.—£30 to £33 per ton.
 POTASSIUM BICHROMATE CRYSTALS AND GRANULAR.—4½d. per lb. nett d/d U.K., discount according to quantity: ground ½d. per lb. extra.
 POTASSIUM CHLORATE.—3½d. per lb. ex-wharf, London, in cwt. kegs.
 POTASSIUM CHROMATE.—8½d. per lb. d/d U.K., or 8d. c.i.f. export.
 SALAMMONIAC.—Firsts lump, spot, £40 17s. 6d. per ton d/d address in barrels. Chloride of ammonia, £37 to £45 per ton, carr. paid.
 SALT CAKE, UNGROUND.—Spot, £3 10s. per ton d/d station in bulk.
 SODA ASH, 58%.—Spot, £6 per ton, f.o.r. in bags, special terms for contracts.
 SODA CAUSTIC, SOLID, 76/77°E.—Spot, £14 10s. per ton, d/d station.
 SODA CRYSTALS.—Spot, £5 to £5 5s. per ton, d/d station or ex depot in 2-cwt. bags.
 SODIUM ACETATE 97/98%.—£21 per ton.
 SODIUM BICARBONATE, REFINED.—Spot, £10 10s. per ton d/d station in bags.
 SODIUM BICHROMATE CRYSTALS (CAKE AND POWDER)—3½d. per lb. nett d/d U.K., discount according to quantity. Anhydrous ½d. per lb. extra.
 SODIUM BISULPHITE POWDER, 60/62%.—£16 10s. per ton delivered 1-cwt. iron drums for home trade.
 SODIUM CHLORATE.—2½d. per lb.
 SODIUM CHROMATE.—3½d. per lb. d/d U.K., or 3½d. c.i.f. export.
 SODIUM NITRITE.—Spot, £19 per ton, d/d station in drums.
 SODIUM PHOSPHATE.—£14 per ton, f.o.r. London, casks free.
 SODIUM SILICATE, 140° Tw.—Spot, £8 5s. per ton, d/d station returnable drums.
 SODIUM SULPHATE (GLAUBER SALTS).—Spot, £4 2s. 6d. per ton, d/d.
 SODIUM SULPHIDE SOLID, 60/62%.—Spot, £10 5s. per ton, d/d in free drums. Crystals—Spot, £8 5s. per ton, d/d in free casks.
 SODIUM SULPHITE, PEACRYSTALS.—Spot, £13 10s. per ton, d/d station in kegs. Commercial—Spot, £9 per ton, d/d station in bags.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—5d. to 6½d. per lb. Crude 60's is. to 1s. 1d. per gall. August/December.
 ACID CRESYLIC 99/100.—1s. 9d. to 1s. 10d. per gall. B.P., 3s. 6d. per gall. 97/99.—Refined, 2s. 2d. to 2s. 3d. per gall. Pale, 98%, 1s. 8d. to 1s. 9d. Dark, 1s. 4d. to 1s. 4½d.
 ANTHRACENE OIL, STRAINED (GREEN OIL).—4½d. to 4½d. per gall.
 BENZOLE.—Prices at works: Crude, 6½d. to 7½d. per gall.; Standard Motor, 1s. 1d. to 1s. 2d. per gall. 90%.—1s. 2d. to 1s. 3d. per gall. Pure, 1s. 5d. to 1s. 6d. per gall.
 TOLUOLE.—90%, 1s. 8d. to 1s. 9d. per gall. Pure, 1s. 10d. to 1s. 11d. per gall.
 XYLOL.—1s. 8d. to 1s. 9d. per gall. Pure, 1s. 10d. to 1s. 11d. per gall.
 CREOSOTE.—Standard specification, for export, 5dd. to 5½d. net per gall. f.o.b.; for Home, 4d. per gall. d/d.
 NAPHTHA.—Solvent, 90/160, 1s. 3d. per gall. Solvent, 95/160, 1s. 4d. to 1s. 5d. per gall. Solvent, 90/190, 1s. to 1s. 2d. per gall.

NAPHTHALENE.—Purified Crystals, £10 per ton.
 PITCH.—Medium soft, 45s. to 47s. 6d. per ton, in bulk at makers' works.
 PYRIDINE.—90/140, 3s. to 3s. 3d. per gall. 90/160, 3s. 3d. to 3s. 6d. per gall. 90/180, 1s. 9d. to 2s. per gall.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:—
 ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.
 ACID ANTHRANILIC.—6s. per lb. 100%.
 ACID GAMMA.—Spot, 3s. 3d. per lb. 100% d/d buyer's works.
 ACID H.—Spot, 2s. 3d. per lb. 100% d/d buyer's works.
 ACID NAPHTHIONIC.—1s. 2d. per lb. 100% d/d buyer's works.
 ACID NEVILLE AND WINTHER.—Spot, 2s. 6d. per lb. 100% d/d buyer's works.
 ACID SULPHANILIC.—Spot, 8½d. per lb. 100% d/d buyer's works.
 ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
 ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
 BENZALDEHYDE.—Spot, 1s. 6d. per lb., packages extra, d/d buyer's works.
 BENZIDINE BASE.—Spot, 2s. 3d. per lb. 100% d/d buyer's works.
 BENZOIC ACID.—Spot, 1s. 8½d. per lb. d/d buyer's works.
 o-CRESOL 30/31° C.—£2 6s. 5d. per cwt., in 1-ton lots.
 m-CRESOL 98/100%.—2s. 9d. per lb., in ton lots.
 p-CRESOL 34.5° C.—1s. 9d. per lb., in ton lots.
 DICHLORANILINE.—2s. 5d. per lb.
 DIMETHYLANILINE.—Spot, 1s. 6d. per lb., packages extra, d/d buyer's works.
 DINITROBENZENE.—7½d. per lb.
 DINITROCHLOROBENZENE.—£74 per ton d/d.
 DINITROTOLUENE.—48/50° C., 7d. per lb.; 66/68° C., 7½d. per lb.
 DIPHENYLAMINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
 a-NAPHTHOL.—Spot, 1s. 9d. per lb. d/d buyer's works.
 B-NAPHTHOL.—Spot, £65 per ton in 1 ton lots, d/d buyer's works.
 a-NAPHTHYLAMINE.—Spot, 10½d. per lb. d/d buyer's works.
 B-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.
 o-NITRANILINE.—5s. 11d. per lb.
 m-NITRANILINE.—Spot, 2s. 6d. per lb. d/d buyer's works.
 p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
 NITROBENZENE.—Spot, 6½d. per lb., 5-cwt. lots, drums extra, d/d buyer's works.
 NITRONAPHTHALENE.—8½d. per lb.
 R. SALT.—Spot, 2s. per lb. 100% d/d buyer's works.
 SODIUM NAPHTHIONATE.—Spot, 1s. 6d. per lb. 100% d/d buyer's works.
 o-TOLUIDINE.—Spot, 8d. per lb., drums extra, d/d buyer's works.
 p-TOLUIDINE.—Spot, 1s. 6d. per lb. d/d buyer's works.
 m-XYLIDINE ACETATE.—3s. 3d. per lb., 100%.

Wood Distillation Products

ACETATE OF LIME.—Brown, £7 5s. to £7 10s. per ton. Grey, £13 per ton. Liquor, 9d. per gall.
 ACETONE.—£63 to £65 per ton.
 CHARCOAL.—£6 to £8 10s. per ton, according to grade and locality.
 IRON LIQUOR.—24°/30° Tw., 10d. to 1s. 2d. per gall.
 RED LIQUOR.—16° Tw., 8½d. to 10d. per gall.
 WOOD CREOSOTE.—1s. 9d. per gall., unrefined.
 WOOD NAPHTHA, MISCIBLE.—2s. 9d. to 2s. 11s. per gall., according to quantity. Solvent, 3s. 9d. per gall.
 WOOD TAR.—£4 to £5 per ton.
 BROWN SUGAR OF LEAD.—£32 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6d. to 1s. 1d. per lb. according to quality; Crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.
 ARSENIC SULPHIDE, YELLOW.—1s. 5d. to 1s. 7d. per lb.
 BARYTES.—£6 to £7 10s. per ton, according to quality.
 CADMIUM SULPHIDE.—4s. 6d. to 5s. per lb.
 CARBON BISULPHIDE.—£26 to £28 per ton, according to quantity; drums extra.
 CARBON BLACK.—3d. to 4d. per lb., ex wharf.
 CARBON TETRACHLORIDE.—£40 to £50 per ton, according to quantity; drums extra.
 CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.
 DIPHENYLGUANIDINE.—2s. 6d. per lb.
 INDIARUBBER SUBSTITUTES, WHITE.—4½d. to 5½d. per lb.; Dark, 4½d. to 4½d. per lb.
 LAMP BLACK.—£28 per ton, barrels free.
 LITHOPONE, 30%.—£18 to £20 per ton.
 SULPHUR.—£9 10s. to £13 per ton, according to quality.
 SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra.
 SULPHUR PRECIP. B.P.—£55 to £60 per ton, according to quantity.
 VERMILION, PALE OR DEEP.—6s. 4d. to 6s. 10d. per lb.
 ZINC SULPHIDE.—8d. to 11d. per lb.

Pharmaceutical and Photographic Chemicals

ACETANILIDE.—Is. 4½d. to 1s. 6d. per lb.
 ACID, ACETIC, PURE, 80%.—£37 5s. per ton d/d address U.K. in casks.
 ACID, ACETYL SALICYLIC.—2s. 7d. to 2s. 9d. per lb., according to quantity.
 ACID, BENZOIC B.P.—Is. 10d. per lb., for synthetic product. Solely ex Gum, 1s. 3d. to 1s. 6d. per oz.; 50-oz. lots, 1s. 3d. per oz.
 ACID, BORIC B.P.—Crystal, £31 per ton; powder, £32 per ton; For one-ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.
 ACID, CAMPHORIC.—19s. to 21s. per lb.
 ACID, CITRIC.—11½d. per lb., less 5%.
 ACID, GALLIC.—2s. 11d. per lb. for pure crystal, in cwt. lots.
 ACID, MOLYBDIC.—5s. 3d. per lb. in ½-cwt. lots. Packages extra. Special prices for quantities and contracts.
 ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. for 28-lb. lots.
 ACID, SALICYLIC, B.P. PULV.—Is. 5d. to 1s. 8d. per lb. Technical.—Is. to 1s. 2d. per lb.
 ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.
 ACID, TARTARIC.—11½d. per lb., less 5%.
 AMIDOL.—7s. 6d. to 11s. 3d. per lb., according to quantity.
 AMMONIUM BENZOATE.—3s. 6d. per lb.
 AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5-cwt. casks. Resublimated, 1s. per lb.
 AMMONIUM MOLYBDATE.—4s. 9d. per lb. in ½-cwt. lots. Packages extra. Special prices for quantities and contracts.
 ARGENT, NITRAS, CRYSTALS.—Is. 1d. per oz.
 ATROPHINE SULPHATE.—7s. to 7s. 6d. per oz., according to quantity.
 BARBITONE.—5s. 9d. to 6s. per lb.
 BENZONAPHTHOL.—2s. 10d. per lb.
 BISMUTH CARBONATE.—7s. 3d. per lb.
 BISMUTH CITRATE.—8s. 4d. per lb.
 BISMUTH SALICYLATE.—7s. 7d. per lb.
 BISMUTH SUBNITRATE.—6s. 6d. per lb.
 BISMUTH NITRATE.—Cryst. 5s. 4d. per lb.
 BISMUTH OXIDE.—10s. 4d. per lb.
 BISMUTH SUBCHLORIDE.—10s. per lb.
 BISMUTH SUBGALLATE.—7s. 6d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.
 BISMUTH ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W. Qts. 11d. per lb. Liquor Bismuth B.P. in W. Qts., 1s. 2d. per lb.; 6 W. Qts., 11½d. per lb.; 12 W. Qts., 10d. per lb.; 36 W. Qts., 9½d. per lb.
 BORAX B.P.—Crystal, £21 10s. per ton; powder, £22 per ton; for one-ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.
 BROMIDES.—Ammonium, 1s. 9d. per lb.; potassium, 1s. 4½d. per lb.; granular, 1s. 5d. per lb.; sodium, 1s. 7d. per lb. Prices for 1-cwt. lots.
 CAFFEIN, PURE.—6s. 6d. per lb.
 CAFFEIN CITRAS.—5s. per lb.
 CALCIUM LACTATE.—B.P., 1s. 1½d. to 1s. 3d. per lb., according to quantity.
 CAMPHOR.—Refined flowers, 2s. 10d. to 3s. per lb., according to quantity; also special contract prices.
 CHLORAL HYDRATE.—2s. 11½d. to 3s. 1½d. per lb.
 CHLOROFORM.—2s. 3d. to 2s. 6d. per lb., according to quantity.
 ETHERS.—S.G. 730—1s. 1d. to 1s. 2d. per lb., according to quantity; other gravities at proportionate prices.
 FORMALDEHYDE, 40%.—30s. per cwt., in barrels, ex wharf.
 GLUCOSE, MEDICINAL.—1s. 6d. to 2s. per lb. for large quantities.
 HEXAMINE.—1s. 10d. to 2s. per lb., according to quantity.
 HYDROGEN PEROXIDE (12 vols.)—1s. 4d. per gallon, f.o.r. makers' works, naked. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 3s. per gall.
 HYDROQUINONE.—3s. 9d. to 4s. per lb., in cwt. lots.
 HYPOPHOSPHITES.—Calcium, 2s. 11d. to 3s. 4d. per lb.; potassium, 3s. 2d. to 3s. 7d. per lb.; sodium, 3s. 1d. to 3s. 6d. per lb.; for 28-lb. lots.
 IRON AMMONIUM CITRATE.—B.P., 1s. 9d. per lb., for 28-lb. lots. Green, 2s. 6d. per lb., list price. U.S.P., 2s. 7d. per lb. list price.
 IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.
 IRON QUININE CITRATE.—B.P., 8½d. to 8½d. per oz., according to quantity.
 MAGNESIUM CARBONATE.—Light B.P., 36s. per cwt.
 MAGNESIUM OXIDE.—Light Commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.
 MENTHOL.—A.B.R. recrystallised B.P., 14s. 6d. per lb. net; Synthetic detached crystals, 8s. 6d. to 10s. per lb., according to quantity; Liquid (95%), 9s. per lb.
 MERCURIALS B.P.—Up to 1-cwt. lots, Red Oxide, crystals, 8s. 4d. to 8s. 5d. per lb., levig., 7s. 10d. to 7s. 11d. per lb.; Corrosive Sublimate, Lump, 6s. 7d. to 6s. 8d. per lb., Powder, 6s. to 6s. 1d. per lb.; White Precipitate, Lump, 6s. 9d. to 6s. 10d. per lb., Powder, 6s. 10d. to 6s. 11d. per lb., Extra Fine, 6s. 11d. to 7s. per lb.; Calomel, 7s. 2d. to 7s. 3d. per lb.; Yellow Oxide, 7s. 8d. to 7s. 9d. per lb.; Persulph, B.P.C., 6s. 11d. to 7s. per lb.; Sulph. nig., 6s. 8d. to 6s. 9d. per lb. Special prices for larger quantities.

METHYL SALICYLATE.—1s. 3d. to 1s. 5d. per lb.
 PARAFORMALDEHYDE.—1s. 6d. per lb.
 PARALDEHYDE.—1s. 1d. per lb.
 PHENACETIN.—3s. 9d. to 4s. 1d. per lb.
 PHENOLPHTHALEIN.—5s. to 5s. 2½d. per lb.
 POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—81s. per cwt., less 2½ per cent.
 POTASSIUM CITRATE.—B.P., 1s. 7d. per lb. for 28-lb. lots.
 POTASSIUM FERRICYANIDE.—1s. 7½d. per lb., in 125-lb. kegs.
 POTASSIUM IODIDE.—16s. 8d. to 17s. 9d. per lb., as to quantity.
 POTASSIUM METABISULPHITE.—50s. per cwt. d/d London, kegs free.
 POTASSIUM PERMANGANATE.—B.P. crystals, 5½d. per lb., spot.
 QUININE SULPHATE.—1s. 8d. per oz. for 1,000-oz. lots.
 SACCHARIN.—43s. 6d. per lb.
 SALICIN.—16s. 6d. to 17s. 6d. per lb., according to quantity.
 SANTONIN.—£50 per kilo for 5-kilo lots.
 SILVER NITRATE.—10d. per oz. for 500-oz. lots, sticks, 2d. per oz. extra.
 SODIUM BARBITONUM.—8s. 6d. to 9s. per lb. for 1-cwt. lots.
 SODIUM BENZOATE B.P.—1s. 6½d. to 1s. 7½d. per lb.
 SODIUM CITRATE.—B.P.C. 1911, 1s. 4d. per lb. B.P.C. 1923, and U.S.P., 1s. 8d. per lb. for 28-lb. lots.
 SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.
 SODIUM NITROPRUSSIDE.—16s. per lb.
 SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—75s. per cwt. net, ton lots, d/s of 5 cwt. Crystals, 2s. 6d. per cwt. extra.
 SODIUM SALICYLATE.—Powder, 1s. 10d. to 2s. 2d. per lb. Crystal, 1s. 11d. to 2s. 3d. per lb.
 SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 2d. per lb.
 SODIUM SULPHITE, ANHYDROUS.—£26 to £28 per ton, according to quantity. Delivered U.K.
 STRYCHNINE, ALKALOID CRYSTAL, 2s. per oz.; hydrochloride, 1s. 9½d. per oz.; nitrate, 1s. 8d. per oz.; sulphate, 1s. 9d. per oz., for 1,000-oz. quantities.
 TARTAR EMETIC, B.P.—Crystal or powder, 1s. 9d. to 2s. per lb.
 THYMOL.—Puriss, 6s. 1½d. to 7s. per lb., according to quantity. Natural, 12s. per lb.
 ZINC STEARATE.—1s. 4d. to 1s. 6d. per lb.

Perfumery Chemicals

ACETOPHENONE.—7s. per lb.
 AUBEPINE (EX ANETHOL).—9s. per lb.
 AMYL ACETATE.—2s. 3d. per lb.
 AMYL BUTYRATE.—4s. 9d. per lb.
 AMYL CINNAMIC ALDEHYDE.—9s. per lb.
 AMYL SALICYLATE.—2s. 6d. per lb.
 ANETHOL (M.P. 21/22° C.).—5s. per lb.
 BENZALDEHYDE FREE FROM CHLORINE.—2s. 6d. per lb.
 BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—1s. 3d. per lb.
 BENZYL ALCOHOL FREE FROM CHLORINE.—1s. 9d. per lb.
 BENZYL BENZOATE.—2s. 2d. per lb.
 CINNAMIC ALDEHYDE NATURAL.—11s. 9d. per lb.
 COUMARIN.—12s. per lb.
 CITRONELLO.—6s. 6d. per lb.
 CITRAL.—6s. 6d. per lb.
 ETHYL CINNAMATE.—6s. 9d. per lb.
 ETHYL PHTHALATE.—2s. 6d. per lb.
 EUGENOL.—8s. 6d. per lb.
 GERANIOL.—6s. to 10s. per lb.
 HELIOTROPINE.—5s. 6d. per lb.
 ISO EUGENOL.—10s. 6d. per lb.
 LINALYL ACETATE, EX BOIS DE ROSE.—7s. 6d. per lb. Ex Shui Oil, 7s. 6d. per lb.
 METHYL ANTHRANILATE.—6s. 3d. per lb.
 METHYL BENZOATE.—4s. 3d. per lb.
 MUSK XYLOL.—6s. 6d. per lb.
 PHENYL ETHYL ACETATE.—10s. per lb.
 PHENYL ETHYL ALCOHOL.—8s. 3d. per lb.
 RHODINOL.—40s. per lb.
 SAFROL.—1s. 6d. per lb.
 VANILLIN, EX CLOVE OIL.—14s. 6d. to 16s. 6d. per lb. Ex Guaiacol.—13s. to 15s. per lb.

Essential Oils

ANISE OIL.—2s. 6d. per lb.
 BERGAMOT OIL.—8s. 3d. per lb.
 BOURBON GERANIUM OIL.—17s. 6d. per lb.
 CAMPHOR OIL.—White, 2s. per lb.; Brown, 1s. 6d. per lb.
 CANANGA.—Java, 8s. per lb.
 CINNAMON OIL LEAF.—4s. 6d. per oz.
 CITRONELLA OIL.—Java, 2s. 2d. per lb., c.i.f. Pure Ceylon, 2s. per lb.
 CLOVE OIL, 90/92%.—6s. 6d. per lb.
 EUCALYPTUS OIL, AUSTRALIAN, B.P. 70/75%—1s. 7d. per lb.
 LAVENDER OIL.—Mont Blanc, 38/40%, 9s. per lb.
 LEMON OIL.—4s. per lb.
 LEMONGRASS OIL.—3s. 1½d. per lb.
 OTTO OF ROSE.—Anatolian, 45s. per oz.; Bulgarian, 65s. per oz.
 PALMA ROSA.—9s. 6d. per lb.
 PEPPERMINT OIL.—Wayne County, 8s. 6d. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.

London, June 18, 1931.

THERE has been rather a larger volume of inquiry on the market during the current week, although demand is still restricted to near requirements. Prices are steady and generally unchanged.

General Chemicals

ACETONE.—Is receiving a fair demand, with the market steady at £60 to £63 per ton, according to quantity.
ACID, ACETIC.—Unchanged at £36 5s. to £38 5s. per ton for technical 80% and £37 5s. to £39 5s. per ton for pure 80%, according to quantity, and there is a regular day to day demand.
ACID, CITRIC.—In slightly better request, and continues in buyers' favour at about 1s. per lb., less 5%.
ACID, FORMIC.—Is in rather better demand, with the price unchanged at £38 per ton.
ACID, LACTIC.—Is steady at £39 per ton for 50% by weight pale technical quality.
ACID, OXALIC.—A brisk demand is being received, with the market firm at £34 per ton, carriage paid.
ACID, TARTARIC.—In wider demand, with the price steady at 11d. to 11½d. per lb., less 5%.
ALUMINA SULPHATE.—Continues to be freely called for, and the market is firm at £7 15s. to £8 5s. per ton for the 17/18% iron free quality.
ARSENIC.—Cornish material is scarce and firm at £19 to £19 10s. per ton, with imported material about £18 10s.
CREAM OF TARTAR.—In steady demand at 80s. to 81s. per cwt., ex warehouse London.
COPPER SULPHATE.—A fairly active demand has developed in this market, with the price steady at about £21 to £21 10s. per ton, less 5%, free on rails London.
FORMALDEHYDE.—In moderate demand at about £29 per ton.
LEAD ACETATE.—Steady at £31 15s. per ton for white, with brown £1 per ton less, and a fair demand has been received.
LITHOPONE.—In steady call at £18 to £22 per ton, according to grade and quantity.

Nitrogen Fertilisers

Sulphate of Ammonia.—Export.—It is understood that the large producers have not come to any decision regarding prices for the season 1931/32. In the meantime, there is practically no business transacted. It is reported that small tonnages have been sold at about £7 per ton f.o.b. U.K. port in single bags, for best neutral quality. Home.—The season for home consumption is now over and it is anticipated that the consumption will show a fall of about 15% on that of last year.

Nitrate of Soda.—At present there is practically no buying of this product, as the consuming season is over and buyers are waiting for the announcement of new prices before considering the covering of their next year's requirements. At the moment last year's prices are in operation, but the amount of business transacted is negligible.

South Wales By-Products

THERE is a slight improvement in South Wales by-product activities. Pitch has a stronger call and appears to hold better prospects than for a considerable period. The demand, however, is still far from satisfactory and supplies are well in excess of the demand. There is no change in values. There is a fair and steady call for road tar round about 13s. per 40-gallon barrel. A similar remark applies to refined tars, with quotations for coke oven and gasworks tar unchanged. Naphthas continue to be quiet, with solvent slightly better. There is no change in solvent or heavy values. Creosote has a weak market, but motor benzol is in fair demand. Patent fuel and coke exports are unchanged. Patent fuel prices, for export, are:—20s. to 20s. 6d., ex-ship Cardiff; 19s. to 19s. 6d., ex-ship Swansea. Coke prices are:—Best foundry, 34s. to 36s. 6d.; good foundry, 22s. 6d. to 25s.; furnace, 16s. 6d. to 17s. 6d.

Latest Oil Prices

LONDON, June 17.—LINSEED OIL was steady at about 5s. advance. Spot, £16 10s., ex mill; June, £14 15s.; July-August, £15 5s.; September-December, £15 15s.; June, £14 15s.; July-August, £15 5s.; September-December, £15 15s.; January-April, £16 7s. 6d., naked. RAPE OIL was lower. Crude, extracted, £26 10s.; technical, refined, £28, naked, ex wharf. COTTON OIL was quiet. Egyptian, crude, £18 15s.; refined common edible, £21 10s.; deodorised, £23 10s., naked, ex mill. TURPENTINE was quiet, unchanged. American, spot, 47s.; July-December, 47s. 6d. per cwt.

POTASSIUM BICHROMATE.—Unchanged at 4½d. per lb., with discounts for contracts, and in fairly good request.
POTASSIUM CHLORATE.—Is a firm market at £28 to £32 per ton, according to quantity, with a brisk demand.
PERMANGANATE OF POTASH.—Continues steady at 5½d. to 5¼d. per lb., ex warehouse, for B.P. needle crystals.
SODIUM BICHROMATE.—The market is unchanged at 3½d. per lb., with discounts for contracts, and in regular demand.
SODIUM HYPOSULPHITE.—Photographic crystals in brisk demand at £14 5s. per ton, with commercial quality at about £8 10s. per ton.
SODIUM PRUSSIAN.—The market is unchanged at 4½d. to 5½d. per lb., with a fairly active demand.
TARTAR EMETIC.—Steady at 10½d. per lb., with rather more business being placed.
ZINC SULPHATE.—Unchanged at £10 10s. per ton, with a fair demand.

Coal Tar Products

THERE is no change to report in the coal tar products market, and prices are unaltered from last week.

MOTOR BENZOL.—Quoted at about 1s. 4½d. to 1s. 5½d. per gallon f.o.r.
SOLVENT NAPHTHA.—Remains at about 1s. 1½d. to 1s. 2d. per gallon f.o.r.
HEAVY NAPHTHA.—Unchanged at about 11d. to 1s. ¼d. per gallon f.o.r.
CREOSOTE OIL.—Is worth about 3d. to 3½d. per gallon f.o.r. in the North, and 4d. to 4½d. per gallon in London.
CRESYLIC ACID.—Quoted at about 1s. 8d. per gallon for the 98/100% quality, and at about 1s. 6d. per gallon for the dark quality 95/97%.
NAPHTHALENES.—Obtainable at about £3 10s. to £3 15s. per ton for the firelighter quality, at about £4 to £4 5s. per ton for the 74/76 quality, and at £5 per ton for the 76/78 quality.
PITCH.—Quoted at 37s. 6d. to 42s. 6d. per ton, f.o.b. East Coast Port, for forward delivery.

HULL.—LINSEED OIL, naked, spot, closed at £15 15s.; June to December, £16; January-April, £16 5s. per ton. COTTON OIL, Bombay, unquoted; Egyptian, crude, spot, £19 5s.; edible, refined, spot, £21; technical, spot, £20 15s.; deodorised, £23. CASTOR OIL, pharmacy, spot, 39s.; first, 34s.; seconds, 32s. (per cwt.). PALM KERNEL OIL, crude, naked, f.m.q., spot, £19 10s. GROUNDNUT OIL, crushed/extracted, spot, £22 15s.; deodorised, £26 15s. SOYA OIL, crushed/extracted, spot, £17 10s.; deodorised, £21. RAPE OIL, crushed/extracted, spot, £26 10s.; refined, £28 10s. per ton. COD OIL, 20s. per cwt. TURPENTINE, spot, 49s. 3d. per cwt.

Scottish Coal Tar Products

A better feeling exists in this area, but, with few exceptions, quotations remain unchanged at previous levels. Coal tar pitch is firmer for forward delivery.

Creasylic Acid.—Orders are scarce but values are unaltered. Pale, 99/100%, 1s. 5d. to 1s. 6d. per gallon; pale, 97/99%, 1s. 3d. to 1s. 4d. per gallon; dark, 97/99%, 1s. 2d. to 1s. 3d. per gallon; all ex-makers' works. High boiling acid is scarce and price to-day is 1s. 11d. to 2s. per gallon.

Carbolic Sixties.—Stocks are high and orders are not plentiful. Value is 1s. 1d. to 1s. 3d. per gallon according to quality.

Creosote Oil.—Enquiries are quite numerous for special grades and prices are steady. Specification oils, 2½d. to 3d. per gallon; gas-works ordinary, 3½d. to 3¾d. per gallon; washed oil, 3½d. to 3¾d. per gallon; all f.o.r. works in bulk.

Coal Tar Pitch.—More business is offering for shipment next season and export value is firmer at 40s. to 42s. 6d. per ton, f.o.b. Glasgow. Home value remains at 35s. to 37s. 6d. per ton f.o.r. works.

Blast Furnace Pitch.—Controlled prices are unchanged at 30s. per ton f.o.r. works for home trade, and 35s. per ton f.a.s. Glasgow for export.

Refined Coal Tar.—With stocks still on the high side value remains unchanged at 2½d. to 2¾d. per gallon f.o.r. in buyers' packages.

Blast Furnace Tar.—Inactive at 2¾d. per gallon f.o.r.

Crude Naphtha.—Available supplies command about 4½d. to 5½d. per gallon, according to quality.

Water White Products are exceptionally quiet. Motor benzol is about 1s. 4d. to 1s. 5d. per gallon; 90/100 solvent, 1s. 3d. to 1s. 4d. per gallon; 90/100 heavy solvent, 1s. 1d. to 1s. 2d. per gallon; all in bulk ex works.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing this firm's independent and impartial opinions.

Glasgow, June 16, 1931.

THE Scottish heavy chemical market shows a steady improvement, with reasonable prospects of permanency.

Industrial Chemicals

ACETONE.—B.G.S.—£60 to £63 per ton, ex wharf, according to quantity.

ACID, ACETIC.—Prices ruling are as follows: glacial, 98/100%, £47 to £58 per ton; pure, £37 5s. per ton; technical, 80%, £36 5s., delivered in minimum lots of 1 ton.

ACID, BORIC.—Granulated commercial, £22 per ton; crystals, £23 per ton; B.P. crystals, £31 per ton; B.P. powder, £32 per ton, in 1-cwt. bags, delivered Great Britain free in one-ton lots upwards.

ACID, HYDROCHLORIC.—Usual steady demand. Arsenical quality, 4s. per carboy. Dearsenicated quality, 5s. per carboy, ex works, full wagon loads.

ACID, NITRIC, 80° QUALITY.—£23 per ton, ex station, full truck loads.

ACID, OXALIC.—98/100%.—On offer at 3½d. per lb., ex store. On offer from the Continent at 3½d. per lb., ex wharf.

ACID, SULPHURIC.—£3 7s. 6d. per ton, ex works, for 144° quality, £5 15s. per ton for 168°. Dearsenicated quality, 20s. per ton extra.

ACID, TARTARIC, B.P. CRYSTALS.—Quoted 1s. per lb., less 5%, ex wharf. On offer for prompt delivery from the Continent at 1½d. per lb., less 5%, ex wharf.

ALUMINA SULPHATE.—Quoted round about £8 10s. per ton, ex store.

ALUM, LUMP POTASH.—Now quoted £8 10s. per ton, c.i.f. U.K. ports. Crystal meal, about 2s. 6d. per ton less.

AMMONIA ANHYDROUS.—Quoted 10½d. per lb., containers extra and returnable.

AMMONIA CARBONATE.—Lump quality quoted £36 per ton. Powdered, £38 per ton, packed in 5 cwt. casks, delivered U.K. stations or f.o.b. U.K. ports.

AMMONIA LIQUID, 80°.—Unchanged at about 2½d. to 3d. per lb., delivered, according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.

ANTIMONY OXIDE.—Spot material obtainable at round about £24 per ton, ex wharf. On offer for shipment from China at about £22 per ton, c.i.f. U.K.

ARSENIC, WHITE POWDERED.—Quoted £22 10s. per ton, ex wharf. Spot material still on offer at £22 15s. per ton, ex store.

BARIUM CHLORIDE.—In good demand and price about £9 10s. per ton, c.i.f. U.K. ports. For Continental materials our price would be £8 10s. per ton, f.o.b. Antwerp or Rotterdam.

BLEACHING POWDER.—British manufacturers' contract price to consumers unchanged at £6 15s. per ton, delivered in minimum 4-ton lots. Continental now offered at about the same figure.

CALCIUM CHLORIDE.—Remains unchanged. British manufacturers' price, £4 15s. to £5 5s. per ton, according to quantity and point of delivery. Continental material on offer at £4 7s. 6d. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—At about £3 15s. per ton, f.o.r. works, or £4 12s. 6d. per ton, f.o.b. U.K. ports.

FORMALDEHYDE, 40%.—Now quoted £29 per ton, ex store. Continental on offer at about £27 per ton, ex wharf.

GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continental on offer at about £3 per ton, ex wharf.

LEAD, RED.—Price now £30 per ton, delivered buyers' works.

LEAD, WHITE.—Quoted £38 per ton, carriage paid.

LEAD ACETATE.—White crystals quoted round about £32 to £34 per ton c.i.f. U.K. ports. Brown on offer at about £1 per ton less.

MAGNESITE, GROUND CALCINED.—Quoted £9 10s. per ton, ex store.

METHYLATED SPIRIT.—Industrial quality 64 o.p. quoted 1s. 8d. per gallon, less 2½% delivered.

POTASSIUM BICHRIMATE.—Quoted 4½d. per lb., delivered U.K. or c.i.f. Irish ports, with an allowance for contracts.

POTASSIUM CARBONATE.—Spot material on offer, £25 10s. per ton ex store. Offered from the Continent at £24 15s. per ton, c.i.f. U.K. ports.

POTASSIUM CHLORATE, 99½/100% POWDER.—Quoted £26 15s. per ton ex store; crystals 30s. per ton extra.

POTASSIUM NITRATE.—Refined granulated quality quoted £20 17s. 6d. per ton, c.i.f. U.K. ports. Spot material on offer at about £20 10s. per ton ex store.

POTASSIUM PERMANGANATE B.P. CRYSTALS.—Quoted 5½d. per lb., ex wharf.

POTASSIUM PRUSSIAN (YELLOW).—Spot material quoted 7d. per lb. ex store. Offered for prompt delivery from the Continent at about 6½d. per lb. ex wharf.

SODA CAUSTIC.—Powdered 98/99%, £17 10s. per ton in drums, £18 15s. in casks. Solid 76/77%, £14 10s. per ton in drums, £14 12s. 6d. per ton for 70/72% in drums; all carriage paid buyer's station, minimum four-ton lots; for contracts 10s. per ton less.

SODIUM BICARBONATE.—Refined recrystallised, £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHRIMATE.—Quoted 3½d. per lb., delivered buyer's premises, with concession for contracts.

SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station; powdered or pea quality, 7s. 6d. per ton extra. Light soda ash, £7 13s. per ton, ex quay, minimum four-ton lots, with various reductions for contracts.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £9 2s. 6d. per ton, ex station, minimum four-ton lots. Pea crystals on offer at £15 per ton, ex station, minimum four-ton lots.

SODIUM NITRATE.—Chilean producers now offer at £10 per ton, carriage paid, buyer's sidings, minimum six-ton lots.

SODIUM PRUSSIAN.—Quoted 5½d. per lb., ex store. On offer at 5d. per lb., ex wharf, to come forward.

SODIUM SULPHATE (SALTCAKE).—Price, 60s. per ton, ex works; 65s. per ton, delivered, for unground quality. Ground quality 2s. 6d. per ton extra.

SODIUM SULPHIDE.—Prices for home consumption: solid 61/62%, £10 per ton; broken, 60/62%, £11 per ton; crystals 30/32%, £8 2s. 6d. per ton, delivered buyers' works on contract, minimum four-ton lots. Special prices for some consumers. Spot material 5s. per ton extra.

SULPHUR.—Flowers, £12 per ton; roll, £10 10s. per ton; rock, £9 5s. per ton; ground American, £8 10s. per ton, ex store.

ZINC CHLORIDE 98%.—British material now offered at round about £18 10s. per ton, f.o.b. U.K. ports.

ZINC SULPHATE.—Quoted £11 per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Trade Publications

A NEW BOOKLET on the application of aluminium in the industries has been issued by the London Aluminium Co., Ltd., of Westwood Road, Witton, Birmingham. Illustrations of welded aluminium pressure vessels, cooling coils, strainers and other plant for the chemical, brewing, distilling, tanning, oil and food industries, are included.

TECHNICAL DATA relating to Diesel engines, compressors, vacuum pumps and gears, has been issued in the form of a convenient pocket edition by Bernard Holland and Co., of 17, Victoria Street, Westminster, S.W.1. This firm supplies vacuum pumps suitable for 99.5 per cent. vacuum.

PATENT AUTOMATIC STILL (gas, steam, and electrically-heated) for the production of distilled water are described in a brochure issued by Brown and Son (Alembic Works), Ltd., of Wedmore Street, Holloway, London, N.19. A second brochure relates to "Sambro" patent laboratory ovens, which are provided with loose removable bottoms.

WASTE HEAT RECOVERY in various industries is discussed in a booklet issued by Musgrave and Co., Ltd., of St. Ann's Iron-works, Belfast. Illustrations are given to show the method adopted for recovering waste heat from kilns, so that it can be utilised for drying purposes.

AN ANALYSIS of essential points relating to the handling of materials, with particular reference to the utility of the conveyor, is to be found in literature which has been issued by the Steel Band Conveyor and Engineering Co., Ltd., of Barker Street Works, Birmingham.

THE CAUSE AND PREVENTION OF RUST in iron and steel, with notes on the "Hardo" hot galvanising process, forms the subject of one of the recent brochures issued by G. A. Harvey and Co., Ltd., of Woolwich Road, London, S.E.7.

Swiss Exports of Ethyl Acetate

ETHYL ACETATE exports from Switzerland in 1930 regained the high 1928 level after dropping in 1929 to 1,658 metric quintals. France, Belgium and Japan were the chief countries of destination for the 1930 exports of 3,248 metric quintals. Imports declined to 607 metric quintals in 1930, compared to 1,595 metric quintals in the previous year, Germany supplying the entire amount in both years.

KEMET PURE ACIDS & CHEMICALS

'KEMET' brand RED LEAD,
highly dispersed, also

SULPHURIC ACID,
all strengths, Oleum, Monohydrate, Battery
Acid, Pure Acids, etc.

HYDROCHLORIC ACID,
all strengths, Saltcake, Sodium Sulphate,
Glaubers Salts, etc.

**THE CHEMICAL & METALLURGICAL
CORPORATION LTD., RUNCORN, ENGLAND**
Telephone: Runcorn 381. Telegrams: Kemet, Runcorn.

SOLE SELLING AGENTS:

BUSH, BEACH & GENT, Ltd.,
Marlow House, Lloyds Ave., LONDON E.C.
Telephone: Royal 7977. Telegrams: "Beafredma," Fen. London.
BIRMINGHAM OFFICE: 133, Edmund Street,
Telephone: Central 3706. Telegrams: "Beafredma," Birmingham.

FRANK SEGNER & Co., Ltd.,
Yorkshire House, Cross Street, MANCHESTER.
Telephone: Blackfriars 7621. Telegrams: "Segner," Manchester.

ILLUSTRATION SHOWS PART OF THE HYDROCHLORIC ACID PLANT.

Manchester Chemical Market

(FROM OUR OWN CORRESPONDENT.)

Manchester, June 18, 1931.

ALTHOUGH the general run of products on the chemical market here show no indication of easing off, there is no sign in any section of prices moving up, the relatively few changes that have occurred since last week being towards lower levels. Trading conditions during the past few days have been rather patchy, with the majority of buyers contracting for smaller quantities than usual. Whilst fair deliveries against old commitments continue to be made to some of the textile dyeing and finishing works, the bulk of the moderate fresh business put through this week has been in respect of comparatively near delivery dates.

Heavy Chemicals

A quiet to moderate demand has been reported in the case of chlorate of soda this week, with prices holding up reasonably well at from £26 5s. to £26 10s. per ton. Some small business has been put through in hyposulphite of soda, which keeps steady at about £9 per ton for the commercial quality and up to £15 5s. for the photographic. There has been no alteration in the price position of prussiate of soda, a moderate inquiry for which is being met with on the basis of 4½d. to 5½d. per lb., according to quantity. Alkali is well held at round £6 per ton and a fair weight of business is being done. Diphosphate of soda is maintained at about £10 per ton, but buying interest on this market continues on rather a restricted scale. Sulphide of sodium is not too strong just now, and sales are relatively slow; the 60-65 per cent. concentrated solid quality is on offer at from £8 15s. to £9 per ton and the commercial material at about £8. Bichromate of soda meets with a fair volume of inquiry and values are maintained at the old level of 3½d. per lb., less 1 to 2½ per cent., according to quantity. Contract quotations for caustic soda range from £12 15s. to £14 per ton, according to grade, and a fair aggregate movement in this section is reported. Saltcake is steady at about £2 15s. per ton, but business this week has been rather slow. There is a moderate demand about in the case of bicarbonate of soda, offers of which are steady at round £10 10s. per ton.

Buying interest in caustic potash this week has been on quiet lines and a certain amount of price reaction is in evidence, current offers being at from about £28 to £28 10s. per ton. Yellow prussiate of potash keeps firm at from 6½d. to 7½d. per lb., according to quantity, and a fair amount of business in this material is being done. Chlorate of potash meets with a quiet demand, and at £27 5s. per ton there has been little change in prices. Permanganate of potash is moving in moderate quantities with the B.P. quality quoted at from 5½d. to 5½d. per lb. and the commercial material at 5½d. There is a quietly steady demand about for bichromate of potash, offers of which are on the basis of 4½d. per lb., less 1 to 2½ per cent. Carbonate of potash has not been particularly active, and at round £24 per ton values are easy.

A quiet trade is going through in the case of arsenic, and prices are steady at up to £19 10s. per ton at the mines for white powdered, Cornish makes. The demand for sulphate of copper continues on a comparatively small scale, and quotations are rather uncertain at about £18 10s. per ton, f.o.b. Not much interest is being shown just now in the acetates of lime, but no further price changes have developed, the grey quality being quoted at £12 5s. per ton and the brown at about £7 5s. There is a quiet demand about for the lead materials, with the acetate at round £32 per ton for the white and £31 for the brown, and nitrate at from £28 10s. to £29 per ton.

Acids and Tar Products

Oxalic acid is maintained at the higher level of £1 14s. per cwt., ex store, but the demand is on quiet lines. Tartaric acid is in moderate request, and values are held at round 11½d. per lb., with citric acid in like position at up to 1s. per lb. Acetic acid keeps firm and meets with a moderate demand at £37 per ton for the 80 per cent. commercial quality and £51 for the technical glacial.

Business in the by-products is generally quiet, but there has been little further movement of prices, offers of pitch being at about 37s. 6d. per ton, f.o.b., with creosote oil ranging from 3d. to 3½d. per gallon, naked, according to grade. Carbolic acid has a somewhat steadier undertone, with crystals at 5½d. per lb., f.o.b., and crude at round 1s. 2d. per gallon, naked.

Company News

BRITISH DRUG HOUSES, LTD.—The usual quarterly dividend of 1½ per cent. on the preference shares will be paid on June 30.

BRITISH OXYGEN CO.—The dividend for the half-year ending June 30, 1931, on the 6½ per cent. cumulative preference shares, is payable on June 30.

RECKITT AND SONS, LTD.—A quarterly interim dividend of 5 per cent. less tax is announced on the ordinary shares, payable July 1. This is an increase of 1½ per cent. on that paid for the corresponding period of 1930, but is in accordance with the directors' recommendation at the last annual meeting to pay larger interims.

UNITED INDIGO AND CHEMICAL CO., LTD.—The directors have decided that a dividend at the rate of 5 per cent. per annum, subject to income tax at 4s. 6d. in the £, for the six months ending June 30, be paid in respect of the preference shares, and that the preference transfer books be closed from June 24 to 30, inclusive.

UNITED WATER SOFTENERS.—After providing £2,000 against outstanding foreign balances, and providing for taxation, there is a net balance of £11,487, from which has to be deducted preference dividend £2,620, leaving £8,867. The directors recommend a dividend on the ordinary shares of 7½ per cent., less tax, carrying forward £3,054.

SOLIDOL CHEMICAL (FRANCE).—The report for the year to March 31, 1931, states that the net loss, after charging depreciation of plant and furniture, directors' fees and management expenses, amounts to £2,484, against a profit of £5,911 last year, less credit balance brought forward, £2,411, leaving debit balance to be carried forward £73.

SANITAS TRUST.—For the year to May 31, 1931, the report states that the net profit, after providing for directors' fees, secretarial fee, general expenses and income tax, etc., amounted to £65,722, to which is added amount brought forward £14,113, making £79,835, out of which dividends have been paid on the preference shares for the year at the rate of 10 per cent. per annum, amounting to £49,000, leaving a balance of £30,835, which the directors recommend should be carried forward.

BLEACHERS' ASSOCIATION, LTD.—The preliminary statement shows that the available profit for the past year, including transfer from tax reserve account, transfer of £90,000 from reserve for equalisation of dividends, and after deduction of depreciation £200,000 and debenture interest £101,250, amounts to £94,576, and with £279,414 brought forward, the available balance is £373,990. After payment of preference dividend for the year, £237,158 is carried forward. The directors regret they are not able to recommend any dividend on the ordinary shares.

STANDARD CHEMICAL CO.—The report for the year ended March 31, 1931, states that the gross profits totalled \$56,819, and, after providing £1,711 for bond and debenture interest, \$35,000 for depreciation, and \$1,500 reserve for income tax, the net profit was \$18,608, a decrease of \$117,191, as compared with the previous year. Having regard to the strong liquid position of the company, the ratio of current assets to current liabilities being 12·4 to 1, the directors have decided to distribute \$18,669 of accumulated undivided profits, and have declared a dividend of \$1·00 per share for the year ended March 31, 1931, payable on June 26, to shareholders of record May 26, 1931.

Chemical Trade Inquiries

These inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

BELGIUM.—An agent established at Brussels is desirous of obtaining the representation of British manufacturers of chemical and pharmaceutical products. (Ref. No. 542.)

BRITISH INDIA.—The Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1, invites tenders for 6,370 lbs. chloroformum B.P., and bismuthi subnitras, carbonas, etc., B.P. Forms of tender are available from the above at a fee of 5s. for each schedule. Tenders are due June 26.

GUTTA PERCHA BOTTLES and CARBOYS

The superiority of these containers is a result of the SILVERTOWN COMPANY'S experience of half a century in Gutta Percha Technology.



These containers are especially made for holding acids, particularly Hydrofluoric Acid, which attacks glass. They are thoroughly immune from corrosion and also easy to clean. They are very hard to break and perfectly leakproof, yet light in weight. Being opaque they prevent the action of light, and they do not influence contents in any way. They close hermetically and open with ease. In other words, they afford safety, efficiency, and ease of handling.

Further particulars on application.

ASK SILVERTOWN TO QUOTE.

THE INDIA RUBBER GUTTA PERCHA & TELEGRAPH WORKS CO. LTD.
(THE SILVERTOWN COMPANY)

Head Office: 106 Cannon Street, London, E.C.4.

Works: Silvertown, London, E.16, and Burton-on-Trent.

Branches in all large Provincial Towns.

SIZES:

Bottles, $\frac{1}{2}$ oz. to 80 oz. capacity.

Carboys, $\frac{1}{2}$ gall. to 10 gall. capacity.

OTHER SILVERTOWN PRODUCTS INCLUDE:

Hose and acid re-
sisting Tubing,
Rubber Gloves and
Gauntlets, Ebonite
Trays, Syringes,
Measures, Funnels,
etc.

Oil from Coal

Competition between Natural and Synthetic Products

A DISCUSSION of current opinion and recent events in the production of oil from coal is contributed to the June issue of *The English Review* by Mr. Alwyne Meade. After referring to the shale oil industry which was successfully practised in mid-Victorian times, but which, with the exception of the Scottish shale works, is now practically extinct, he states that so far as the low temperature carbonisation of ordinary bituminous coals and slacks is concerned, "the oils have so far proved most disappointing in quality and their return, as with ammonia products, is negligible in assisting the costs of the treatment of the coal. It is to be hoped that in the perfecting of either a cracking or hydrogenating process a means may be found for rendering these oils suitable and efficient substitutes for imported natural oils, and thereby improving their value. Until this can be successfully achieved commercially, and the consumer of solid smokeless fuel has to pay no more than he pays for raw coal, it is unlikely that there can be any hopeful future for any low temperature process whose sole or at least principal aim is, in any case, the production of a domestic fuel superior to coal and not the production of oil.

"Apart from any problems which beset the actual chemical and physical process of conversion there is, or was, the outstanding difficulty of building plant which will stand up to the conditions prevailing. As is well known, Germany was the pioneer in hydrogenation, and early in this year it was announced from that country that the laboratory for carrying out large-scale experiments on hydrogenation of coal established at Duisburg by the A.G. für Steinkohleverflüssigung und Veredelung had been closed owing to the want of suitable materials for the parts of the plant exposed to very high pressures, which were very quickly worn out. The same trouble has prompted the I.G. Farbenindustrie to curtail considerably its activity in the field of hydrogenation of coal."

The only question at issue to-day is whether the production of oil from coal by hydrogenation has or is likely to yield results commercially useful. "Billingham, so far as the outer world is concerned, is as silent as the Sphinx, but it is not going too far to say that the technical staff at this establishment have in at least one important direction beaten the Germans at their own game." Billingham has a 10-ton unit in operation and is undoubtedly producing a highly anti-knock spirit, but the question in Mr. Alwyne Meade's mind is whether this spirit can be produced at a price which can compete with untaxed foreign oil.

Chemical Industry of Czechoslovakia

IN the report on "Economic Conditions in Czechoslovakia," by Mr. H. Kershaw, just issued by the Department of Overseas Trade (H.M. Stationery Office, pp. 46, 1s. 6d.), it is stated that the situation in the chemical industry began to exhibit signs of the general depression in the first six months of the year, particularly in the case of artificial fertilisers, the sales of which were considerably lower than in 1929. In the latter half of the year these conditions became worse, and the immediate business prospects are not encouraging. Prices fell during the course of the year, especially as regards fertilisers, manufacturers being obliged to make sacrifices in order to meet the reduced purchasing power of the agricultural community. The heavy chemical industry in particular, as a result of reduced turnover and low prices, is in a weaker position to meet the sharp competition from Germany, and has been obliged to adopt measures to rationalise production with a view to forcing down costs of production.

Uses of Canadian Bentonite

POSSIBLE industrial uses for Canadian bentonite are outlined in *Mines Branch Report No. 723*, which has been issued by the Department of Mines for Canada. This report follows one which was issued in 1924 (*Mines Branch Report No. 626*) which dealt chiefly with the character, occurrence and properties of this clay-like material, of which many deposits exist in Western Canada. At present, the two most important uses for bentonite are in oil refining and foundry work, but its applications in cement, mortar and concrete are also under investigation.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]

AISCHE (M. I.) AND CO., LTD., Stoke-on-Trent, chemical and colour manufacturers. (M., 20/6/31.) Registered June 1, £1,788 18s. 1d. debentures to G. Goodwin, New House, Werrington Road, Bucknall; general charge.

Satisfaction

BRITISH ALIZARINE CO., LTD., Manchester. (M.S., 20/6/31.) Satisfaction registered June 10, all moneys, etc., registered October 4, 1921

London Gazette, &c.

Winding-Up Petition

SUBMERGED COMBUSTION, LTD. (W.U.P., 20/6/31.) A petition for the winding-up of the company by the High Court of Justice was, on June 4, presented to the court by Stafford Clark and Co., of 1, Bush Lane, Cannon Street, London, and is directed to be heard at the Royal Courts of Justice, Strand, London, on June 22.

Company Winding Up Voluntarily

BRINJES AND GOODWIN, LTD. (C.W.U.V., 20/6/31.) By reason of its liabilities, June 4. Mr. Roderick M. Peat, of Peat, Marwick, Mitchell and Co., appointed liquidator.

Tariff Changes

AUSTRALIA.—Alterations introduced March 27 include "Acetyl-salicylic acid in powder form" for which the British preferential tariff is increased from "free or 15 per cent." to "25 per cent. *ad valorem*," whilst the general tariff is increased from "15 or 25 per cent." to "40 per cent. *ad valorem*." The additional duty of 1½d. per gallon on naphtha, benzene, benzoline, gasoline, pentane, petrol, and any other petroleum or shale spirit now applies when in containers of less than 40 gallon capacity, instead of when in containers of any description. No change is made in the duties on turpentine substitutes. Solar oil, formerly dutiable to the amount of 1d. to 1½d. per gallon, is now free when used in the treatment of metallic ores, as fuel, or in the manufacture of gas.

BRITISH INDIA.—In view of the many alterations of Customs duties which have been made during the first few months of the present year, a revised edition of the Indian Customs and Valuation Tariff was issued as a supplement to *The Board of Trade Journal*, June 11. (H.M. Stationery Office, price 6d. net).

Work of the Irish State Laboratory

ACCORDING to the *Irish Trade Journal* the State Laboratory of the Irish Free State examined 42,023 samples during the year 1929-30. The majority of the work carried out was for the Revenue Commissioners, assessing import duty to be paid, and the Department of Agriculture. A good deal was done for the Department of Lands and Fisheries in connection with the investigation of the iodine content in sea-weeds and kelp from the west coast. Work carried out on behalf of the Department of Industry included the sampling of margarine for a scheme for the supervision of price and quality of margarine offered for sale in the Free State. Work was carried out for several other departments, including that of the Minister for Justice, for whom investigations were made in eleven cases of suspected poisoning.

